THE
PROCEEDINGS
OF THE
Cotteswold Naturalists' FIELD CLUB

1872—1873.

President.

SIR WILLIAM V. GUISE, BART., F.L.S., F.G.S.

Vice-Presidents.

T. B. LL. BAKER, ESQ., F.S.S.
THOMAS WRIGHT, M.D., F.R.S.E., F.G.S.
WILLIAM C. LUCY, F.G.S.

Honorary Secretary.

WILLIAM HENRY PAINE, M.D., F.G.S., F.M.S.

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JOHN BELLOWS, PRINTER, GLOUCESTER.

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GENTLEMEN,—

The return of Spring calls us again together, and it is with great satisfaction that I am able to assure you of the continued activity and prosperity of the Cotteswold Club. Our numbers are well sustained, and though our Secretary reports a few vacancies, there are several eligible candidates awaiting election, who if elected, will fill the void. Our field Meetings have been well attended, and I have noticed no falling off either in numbers or interest on these occasions. We have lost by death one of our oldest associates, Mr. DAVID MOWBRAY WALKER, the late proprietor of the *Gloucester Journal,* who, though at no period of his life a Naturalist, took always a lively and intelligent interest in the proceedings of the Club; and the columns of his widely circulated print were always freely open to the records of our papers and proceedings.

While on the subject of those whom death has taken from us, it would not be fitting that I should pass without notice here the name of one of the Founders of Modern Geologic Science—the grand old Silurian Chief, Sir RODERICK MURCHISON—one of the last of that glorious band of observers, who within the last fifty years have established the laws of Stratigraphical Geology, upon a basis of truth as enduring as the rock-masses upon which the Science is founded. One by one these fathers of the Science are passing from among us, and of those that are left, it may be said they are indeed

" Rari nautes in gurgite vasto."

When they are gone, there would seem be none to succeed them; for amateurs though they were—in the sense of never having been *professionally* educated in scientific training—yet so well and thoroughly have they done their work, so broadly and surely have they fixed the great principles of Geologic Science, that to those who come after them it is only left to elaborate the details and fill up the gaps in the cosmic history, with the main facts and sequence of which we are now familiar.

No science has ever had a more devoted band of searchers after truth for its own sake than the Science of Geology; not the mere truth of speculation and theory, but the truth of *hard facts.* The ground which at present seems to present the most promising field for interesting discovery lies amongst the Quarternary Gravels, and in the beds immediately below them. It is there the traces of the earlier races of men are to be looked for. Evidences bearing on this question are accumulating from many quarters—but the time would hardly seem to be yet ripe—the facts not yet sufficiently multiplied, to justify generalisations; but wait, work, observe, compare, and before long all that now seems complicated and obscure will be unravelled; and we shall have the sequence of these later beds and their organic contents as perfectly classified and understood, as any of the earlier and more ancient deposits.

I will now proceed to recount the proceedings of the Club at its different meets.

THE ANNUAL MEETING

was held at the Spread Eagle Hotel, Gloucester, on Wednesday, 5th April, when between 40 and 50 Members assembled. The officers for the ensuing year were chosen, when you again did me the honour to elect me as your President, with Dr. Wright and Mr. Lucy, as Vice-Presidents, and Dr. Paine as Hon. Secretary.

The programme for the day embraced a visit to the field near

BARBER'S BRIDGE, AT RUDFORD,

where from time to time human remains in great quantities have been found; especially about three years since, when in moving the soil somewhat extensively for agricultural purposes, the labourers in the employ of W. P. PRICE, Esq., M.P., came upon 86 skeletons laid side by side in two rows. An account of this discovery was published by Mr. PRICE at the time, in the columns of the *Gloucester Journal,* together with a mass of evidence oral and documentary, which clearly went to shew that these were the remains of a force known as "Lord HERBERT's Welshmen," who fell, to the number of 500 or 600 men, under the blows of WALLER's troopers, on the 26th March, 1643.

On the way to Rudford, the attention of the party was directed to the entrenchments thrown up by MASSEY's troops, on the crest of Vineyard Hill, at Over, the outlines of which are plainly distinguishable from the high road. Near Highnam Court the form of a redan may still be traced. Further on, where the road makes a sudden descent at Rodway Hill, the carriages were stayed while the party explored the lines of entrenchment on the highest point of the hill on the Highnam Estate. These within the memory of old men still living, were known as "the Welshmen's 'trunchments." The position is a commanding one, and completely sweeps the approaches by the Newent road.

Barber's Bridge is a brick structure of one arch over the Leadon, which at this point, and for the greater part of its course, is a deep and muddy stream, passable only at certain fords, which were easily guarded. At the period of the Civil Wars there was no bridge at this point; and here it was that penned in by the impassable stream, and the scarcely more passable ford, the unfortunate Welshmen of the Lord HERBERT's force are said to have been overtaken, and utterly destroyed by WALLER's dragoons.

A party of labourers had been set to work in the same field wherein the bodies had been found in 1868, to dig for more; and on the arrival of the Club two skeletons were exposed, lying side by side, at a depth of 2½ feet; one of these was headless. They were found stretched at length and in common with the others previously discovered, had probably been stripped before interment, as scarce a vestige of metal was found with them.

From this "field of the dead," the party was conducted by Capt. PRICE to Tibberton Court, where a glass of sherry and a biscuit, which had been promised, developed into a splendid cold collation with Champagne and all kinds of luxuries.

While his guests were thus agreeably occupied, Capt. PRICE read a paper of some length, in which he had embodied all the information bearing upon the slaughter at Barber's Bridge, whether contained in the published records of the time, or preserved in local traditions which still linger about the spot.

The most remarkable point in connection with the occurence is, that the written reports of the time make little or no allusion to it. CLARENDON is wholly silent in respect of it. It would seem indeed that there were circumstances attending the slaughter, which gave colour to the charge of treachery on the part of the Parliamentarian troops, which if true, would account for the silence of their partisans on the subject. Still, there are collateral evidences in letters and pamphlets *on the other side*, which point distinctly to a great slaughter on the occasion of the surrender of the Lord HERBERT's forces at Highnam; and the local tradition on the subject is clear and unmistakeable. It seemed most desirable that these scattered evidences should be collected and preserved; and Capt. PRICE's paper will hand down in the transactions of the Cotteswold Club all that can now be recovered of this interesting episode of our civil wars.

After dinner at the Spread Eagle, the President read his Annual Report upon the proceedings of the Club during the past year; after which, MR. ETHERIDGE of the Geological Survey, read a paper on the physical structure of the Watchet Area, and the relation of the Secondary Rocks, to the Devonian Series of West Somerset.

This paper was illustrated by several beautiful sections shewing some of the more remarkable "faults" by which these beds are interrupted, with detailed measurements and lists of fossils from the "Keuper" to the "Bucklandi Beds" of the Lower

Lias. These will prove of the greatest value to Cotteswold Geologists, by enabling them to correlate the Secondary Rocks of North Somerset with the well-known sections at Westbury, Aust and Wainlode in our own county. Mr. Etheridge dwelt upon the wonderful changes of condition, the disruption, the distortion and the vast scale of denudation, which marks the area of North Somerset and North Devon, and declared that after careful study of the same Geological Series in the north of Europe, in Germany, and in Alsace, he had no hesitation in saying that the former region exhibits the most remarkable and magnificent exposition of these beds to be found in the world.

Mr. Niblett exhibited a very curious hone-stone deeply worn by friction on both sides, which was found in gravel at a depth of 15 feet, about 1½ miles from Hereford.

The Rev. W. S. Symonds of Pendock, shewed a human head rudely sculptured in Sandstone, about six inches in length by two in breadth, which was found at a depth of four feet on Gadbury Camp, near Pendock. There was nothing to mark the age of this fetish-like idol, to which, however, experienced antiquaries seemed to attach a remote antiquity.

Wednesday, 17*th May*.—The first Field Meeting of the Season took place at

THORNBURY.

The Members assembled at the Yate Station on the arrival of the train leaving Gloucester at 10.10., where they were met by Mr. Thurston of Thornbury, and Mr. Macdonald, engineer of the new line between Yate and Thornbury. Mr. Macdonald had kindly fitted up a railway-truck with seats, and, with a team of horses, the party started on the new line.

The first halt was made near Iron Acton, for the purpose of examining the celebrated Preaching Cross, of which there is a good illustration and description by Mr. C. Pooley, in the proceedings of the Club. Mr. Niblett cheerfully responded to the call to give an explanation of the Cross, and mounting to the place where the preachers of old were accustomed to stand, he made some appropriate remarks upon the structure, which as an early Preaching Cross is said to be unique.

The old Church with its massive tower next engaged attention, but as it contained nothing of particular interest the party proceeded to Frampton Cotterell, to examine the great Hœmatite beds, worked there by a new company. The shaft of the mine pierced in a line of fault, is in depth 80 yards, and yields a very large quantity of very rich iron ore containing from 60 to 70 per cent of iron, which is obtained from beds of Pennant Sandstone, one of the members of the great carboniferous series. Much steam power is needed to free the mine from the large quantity of water that percolates by the lines of fault, and a powerful engine with four large boilers is constantly in operation to keep the water in subjection.

The country to the north of Frampton Cotterell presents several lines of fault. At the West, Frampton Cotterell; in the middle, Ram Hill, Iron Acton, Rangeworthy; and at the East, the May's Hill faults. All these lines of dislocation contain extensive deposits of brown hœmatite or hydrated peroxide of iron, similar to that obtained in such abundance at Frampton Cotterell.

On leaving the iron-mine, the party proceeded to the railway cutting at Tytherington, to examine a very fine section of the carboniferous limestone and dolomitic conglomerate. The beds of limestone present numerous distortions, and its strata dip away at a considerable angle, on which the dolomitic beds repose in a nearly horizontal position. This cutting presents very fine examples of the uncomformable position of these two rocks, which tell a tale of long-lapsed time between the deposition and up-heaval of the limestone and its subsequent covering over by the dolomitic deposit. At the Thornbury side of the tunnel the conglomerate character of the deposit is very well shewn. This is a most interesting section, and the club learnt with pleasure that Mr. Macdonald is preparing a diagram, worked to scale which I hope will find a place in our published transactions.

After leaving the tunnel the view is very fine; the Severn opens out before the observer, and the beautiful tower of Thornbury Church is a fine feature in the landscape.

The Club first examined the Church. The tower, and body of the Church, which formerly belonged to the Abbey of Tewkesbury, are said to have been built by a FITZHARDINGE; the South aisle by HUGH Lord STAFFORD. There are several handsome tombs, one of THOMAS TYNDALE buried 1571; another of Sir JOHN STAFFORD, obt. 1624; and likewise memorials of MARY, wife of EDWARD Lord STAFFORD, grandson to EDWARD Duke of BUCKINGHAM; she died in 1609. The interior of the edifice is well kept and in good order.

Close adjoining to the Church, is Thornbury Castle; but this interesting historical mansion, the Club were not suffered to visit, though our courteous secretary Dr. PAINE had exerted himself to obtain the desired permission. This was a cause of much disappointment, and it is worth noting that this was the first occasion on which any difficulty has been experienced by the Club, in obtaining admission to such halls or baronial mansions as have chanced to come within the scope of their days' rambles, where on the contrary they have met with every courtesy and not unfrequently with princely entertainment.

It was fortunate for the Club that they numbered among their members an antiquary in Mr. NIBLETT, who had prepared a memoir of the Castle, illustrated by numerous diagrams, by help of which the party were put in possession of all the principal facts connected with this grand historical pile.

Thornbury Castle was built in the reign of HENRY VIII. Eleven years were occupied in building it, and it was unfinished at the death of its founder, STAFFORD Duke of BUCKINGHAM; nevertheless it was then habitable and capable of housing and entertaining a goodly company, as shewn in the Stafford Household book which is still in existence. It was a castellated mansion rather than an actual castle. There is no keep, or stronghold as at Berkeley Castle, nor was it ever intended to resist a siege. Privacy and comfort, not defence, were the intentions of the founder.

Mr. NIBLETT gave an interesting account of the circumstances which led to the decapitation of the Duke, whose death he remarked, was a foul and deliberate murder. His faults seem to have been a love of display and pride of ancestry, and an indiscreet tongue. He was a man of noble and princely ideas. He began the foundation of a College at Cambridge, and a hospital at Thornbury. He also contemplated bringing a canal from the Severn to Thornbury, a distance of between 2 and 3 miles, traces of which may be seen in the Pithay Field, also between the present Gas works and the Union Workhouse, where it has a width of 42 feet at bottom, and 60 feet at top, cut through very hard magnesian conglomerate.

Wednesday, 7*th June*.—The Second Field Meeting was held at

SWINDON.

Those who travel by the Great Western Railway from Gloucester to Swindon, will in their journey, pass over the entire series of beds, known to Geologists under the term "Jurassic," which in this country may be studied, as a whole, in greater completeness than in any other part of the world. Thus it happens that while on the Continent of Europe, certain beds are locally more developed than with us, yet those who desire to acquaint themselves with the phenomena of the entire series, and their relations to one another, must still come to Cheltenham, as the great typical section which supplies the clue to the reading of all the rest.

Gloucester stands upon the Lower Lias, the base of the whole series. As the rail ascends the escarpment of the Cotteswolds, it passes over the Middle and Upper Lias and the entire thickness of the inferior Oolite. On emerging from the tunnel at Sapperton, the traveller sees the great Oolite like a wall upon either hand. At the Tetbury Road Station is a thin layer of Bradford Clay with its characteristic fossils, to which succeeds the "Forest Marble," both these latter being a part of the "Great Oolite" series. At Kemble a small patch of "Cornbrash" is brought in by a fault, of which formation a larger tract is passed over just before reaching Oaksey. Oaksey itself stands upon the "Oxford Clay" which the line follows till a mile beyond Purton, when the "Coral Rag" succeeds, upon an eminence of which the village of Purton stands. But the line soon passes on to the "Kimmeridge Clay," which it traverses until the Station at Swindon brings us to the foot of the Hill of "Portland Oolite" on which the town of "Old Swindon" is built.

We have thus passed over this vast succession of beds, accumulated in ancient sea-bottoms and filled with special forms of life, together comprising one of those groups of life-history having certain characters in common, on which Geologists have bestowed the term "Jurassic," from the Jura in Switzerland, which is composed entirely of these beds.

The meeting at Swindon was but thinly attended, nevertheless the programme was an attractive one. It comprised a visit to the works of the Great Western Railway at Swindon, and an excursion into the country around Swindon as far as Barbury Camp.

The Railway works alone were deserving of a special visit. The manager, Mr. ARMSTRONG, kindly conducted the Club through the various departments, explaining the principal objects of interest in passing. The process of casting and rolling the iron rails was very interesting, as was likewise the action of the planing machines, by which the iron was smoothed or grooved with as much facility as if it had been so much wood. The carriage department was likewise visited, and the construction of a first class carriage explained in all its details. The round of the works having been completed, Mr. ARMSTRONG kindly invited the members of the Club to luncheon, an invitation which met with very cordial acceptance.

At 1.30 the members assembled at the Goddard Arms at Old Swindon, from whence, after a visit to the quarries, the party proceeded in a break and pair by way of Wroughton to Barbury Camp. At Wroughton they diverged a little, and sending the carriage round to meet them at the top of the hill, they passed through a pretty wooded dell called Overton Combe, where the reservoir for the supply of Swindon with water is placed on the "Gault Clay," the porous beds of the "Upper Greensand" above, being the sponge which collects the waters. Regaining their carriage they followed a bone-setting track to the foot of the Chalk escarpment, on the summit of which is placed the remarkable entrenchment known as Barbury Camp. From hence a magnificent prospect is obtained extending over Marlboro' Downs as far as Avebury and Marlboro' on the South and East, and including a large part of Wilts, Gloucestershire, and Berkshire on the North and West.

Barbury Camp is indeed a grand earthwork consisting of a double rampart and foss, the inner vallum being at least 40 feet in height from the bottom of the foss. The work is circular and is probably of British origin, not Roman—but quite possibly, post-Roman. Some portions of the turf within the enclosure had lately been moved, and here some of the party discovered several examples of rude coarse pottery only partially burnt and shewing no signs of the wheel; with these were associated stones which bore upon the surface evident marks of fire. From this it seems probable their further search might yield additional traces of the earlier occupants of this remarkable hill-fort.

CAMDEN says of Barbury Castle—"This great fortification, the burrows on the adjoining plains, and the similitude of names, seem to point out this place as the scene of the battle in which Cenric, King of the West Saxons, and his son Ceaulin, defeated the Britons, A.D. 556."

Wednesday, 26th July.—The third Field Meeting was held at

BERKELEY,

where a large number of Members assembled.

Under the guidance of J. H. COOKE, Esq., the party proceeded at once to the Castle, and remained some time in the Great Hall examining the manuscripts and other documents of interest, which, Mr. COOKE had received permission from Lord FITZHARDINGE to exhibit. Some of the most important were described by Mr. NIBLETT, who read a short paper on them. We especially noticed a magnificently emblazoned "*Book of Arms*" dedicated to GEORGE, Earl of BERKELEY, by "*Joannes Covellus*" (JOHN COWELL) with the date of 1681; and the *Chartulary of St. Augustine's Abbey, Bristol*, on vellum, in the original boards. The oldest writing in this book appeared to be late in the 14th or early in the 15th century, and there are additions by later hands. The book contains copies of charters and donations to the Monastery of St. Augustine. The headings of each are rubricated, and the initial letters illuminated, probably by two different hands. This is the Book so often mentioned in SMYTHE's lives of the Berkeley Barons, and which was missing from amongst the records of Berkeley Castle for more than 50 years, having probably been stolen. It was recovered at an auction, and restored to its proper owners on the 24th February, 1804. There are also at Berkeley Castle three MSS. copies of SMYTHE's Lives of the BERKELEYS, one of them in vellum, in three vols. folio, with copies of the Great and Privy Seals, many of which are given in Lysons's Antiquities of Gloucestershire, and in Dallaway's Heraldic Enquiries.

Before leaving the Great Hall, Mr. COOKE read a paper on the early history of Berkeley and its possessors. The first mention of Berkeley is in the reign of EDWARD THE CONFESSOR, in the celebrated Legend of the Witch of Berkeley, on which SOUTHEY wrote his well-known ballad. At that time the site of the Castle was occupied by a wealthy nunnery, which about the year 1043 fell into the clutches of the celebrated Earl GODWIN through a fraudulent artifice: but he seems to have held his ill-gotten spoil for a very short time; as he fell into disgrace, and died about 1053. EDWARD THE CONFESSOR, after GODWIN's death, retained Berkeley, and granted it at a fee-farm rent to ROGER Lord of DURSLEY. At the Conquest, ROGER was permitted to hold it, and it remained in his family to near the end of the reign of STEPHEN. During the contentions for the crown between STEPHEN and the EMPRESS MAUD and her son, afterwards HENRY II, the Lord of DURSLEY, as a crown vassal, supported his Sovereign, and upon the accession of HENRY was punished for his fidelity by being deprived of Berkeley, which the KING bestowed on ROBERT the son of HARDING, who had been one of the principal adherents of the EMPRESS his mother. This Robert was the founder and direct ancestor of the present noble family of Berkeley, and the manor has continued in the possession of his descendants, with the exception of one alienation, down to the present time.

The Castle at its first erection consisted of the keep only, and the buildings within it, the remainder being the work of the three succeeding Lords, and was only completed during the reign of Edward III. The History of Berkeley and its Lords is thenceforth a part of the History of England, there being hardly a transaction in the civil or military annals of the kingdom in which they were not mixed up. During the civil wars of CHARLES the 1st's reign the Castle was first of all occupied by the Parliament, but the garrison was withdrawn to reinforce that of Gloucester, after which it was held by the Royal forces. In 1645 the Parliamentary troops besieged the Castle, and after taking the town and church by storm, it was surrendered upon honourable terms on the 26th of September. To render it thereafter incapable of defence, a large gap was made which is visible on the north-west side of the keep, and it was then given back to GEORGE, Lord BERKELEY.

After reading his paper, Mr. COOKE exhibited some remains lately found in an ancient cemetery near Wick, which was visited by many of the Club later in the day. There were portions of two skulls with other bones, several coins and pieces of pottery, all of Roman origin so far as could be ascertained.

The church was next visited. It has been lately restored by Mr. GILBERT SCOTT, and contains some excellent examples of "early English" work, a remarkably bold west window, and some good bits of wall painting. The monuments are numerous and well preserved. One, an ancient raised tomb, has on it two full-length figures in alabaster, representing THOMAS Lord BERKELEY and his wife, who died about 1361. Others of the BERKELEY family are likewise buried here, and the Mortuary Chapel contains many of their tombs. Here too are buried the remains of one whose name, of world-wide celebrity, will outlast the fame of the old iron-headed barons whose grander monuments seem to flout the plain slab which bears the honored name of "JENNER." It is fitting that some more appropriate memorial should mark the resting-place of such a man, and it will be gratifying to the Club to know that efforts are now being made to raise a subscription for that purpose.

During the restoration of the Church many Roman remains were discovered in the excavations, and one of these, a Roman brick with a monogram and inscription, is placed in the wall on the south-side of the chancel, where it is well preserved.

After luncheon at the Berkeley Arms, the Club proceeded in carriages into the country, the objects of interest being a supposed British encampment and a large quarry of trap rock in Michaelwood Chase. On the way the Club halted near Wick to see the Gravel Pit in which were discovered the coins, pottery, and human remains shewn at the Castle in the morning. The gravel consisted principally of Oolitic detritus. The bones and pottery were found about two feet below the surface, resting on gravel. The ground if more fully explored might yield some interesting discoveries.

On reaching Michaelwood, the so-called camp was examined, but beyond a strong defensive position there was nothing to indicate actual occupation.

The quarry at the foot of the hill worked in a "greenstone dyke" was visited by the Club in 1865, and reference to it will be found in pages 22 and 23 of the proceedings C.N.F.C., 1866. I now append a somewhat fuller notice of the rocks in question which has been furnished by our associate the Rev. F. SMYTHE.

NOTE ON THE TRAP ROCKS OF WOTTON-UNDER-EDGE.

The Hornblendic Trap Rocks at Damory Bridge may be correctly described as a fine-grained Serpentinous Greenstone of schistose structure. Fragments of the rocks on examination show a coating of soft serpentinous matter, marked by "Slickensides" polish, and a rude wavy structure, undulating in the foliations, the surfaces being covered with a dark green Hornblende in irregular aggregations of imperfect crystals. This Greenstone, or Diorite, is generally of a fine-grained texture, in colour cool grey, inclining to green. The Serpentinous character is due to the metamorphism the rocks have undergone.

These traps have on the whole the same rock-constituents as the Hornblendic Granite or Syenite of the Malvern Hills; the difference being one of arrangement or atomic constitution; for the crystalline quartz of the Syenite is here only amorphous or else in the form of cherty veins, traversing the rock in various directions; whilst only a little distance off, at Charfield Green, we meet with a modification of the same rock, where, owing to the presence of the Carboniferous Limestone of the Bristol coal-field (here reaching its northern apex) the Trappean Rock presents itself in form of an "amygdaloid," containing kernels of calc-spar in a Greenstone base; the symmetrical cavities as they existed when the mass was in a fused state, having originally become elongated, an effect due to lateral pressure which has moreover produced cleavage-planes throughout the mass. The Charfield Green trap I take to be nearly the normal form of the Igneous rock of this neighbourhood, unchanged by forces that subsequently so altered and metamorphosed the Damory Bridge mass. In this latter rock we observe here and there streaks and patches of Epidote, a silicate of Alumina. This mineral which is characterized at Malvern by its bright yellow colour, is here of a dark or tawny olive yellow, in consequence of its association with Hornblende. In a hand-specimen of the Charfield Green rock, which I brought away on a former visit, I find that some of the Calcite Kernels are coated with a vivid green substance. This M. DELESSE considers may be the result of the greenness of some of the Felspar composing the rock; but it is no doubt owing to the Hornblende which combines with the Felspar to produce such a bright green tint.

At Damory Bridge the rock is quarried for road material, and weathers in the quarry to a dull dark brown colour.

Wednesday 16*th August.*—The fourth Field Meeting was held at

TETBURY.

The object of the day's excursion being a visit to Calcot Barn, Beverstone Castle, and the quarries near Chavenage. The

Members assembled at Nailsworth Station on the Midland line and proceeded in carriages to Calcot.

On ascending the hill to Barton End a halt was made at the stone quarries, where Mr. Witchell called attention to the thinning out of the Middle Division of the Inferior Oolite; the whole of the Oolite Marl series together with the Upper Freestone beds appearing to be altogether wanting; the lower Freestones being capped by the Trigonia beds on Ragstone. The upper surface of the Freestones showed extensive marks of boring, and an example of *Lithodomus* at the extremity of its burrow was pointed out, the shell remaining just as the animal had left it after the termination of its operations. Oysters also in great numbers are attached to the surface, shewing that in this part of the oolitic sea a pause of some duration took place.

On regaining the road, Mr. G. F. Playne pointed out on the opposite side of the valley the old vicarage of Horsley, once occupied by the antiquarian Fosbrooke, a short account of whose life he read from notes made some years before.

The party then proceeded to Calcot Barn, and were shewn over it by the tenant Mr. Drew. This building is a well-known landmark in the surrounding district, and on account of its antiquity is rarely overlooked by tourists. Its present appearance is marred by a tall chimney-stack erected against its south side, thereby illustrating how in modern farming, steam has supplanted the manual labour of the middle ages.

The following account of the Barn, communicated by Mr. Lysons was read.—

"Calcot Barn is in the neighbourhood of Newington Bagpath. It is 140 feet long by 37 feet 4 inches wide. It was built A.D. 1300, as appears by an inscription on a coign stone inside the south porch. There is an inscription on another part of the same porch stating that the barn was burnt down by lightning, October 9th, 1728, and was rebuilt at the cost of Thomas Estcourt, Esq., and John Pitt Carpenter, and finished October 20th, 1729. But from the appearance of the side walls it seems probable that it was only the roof which was destroyed, as it is evident that the upper part of the walls have been repaired, while the lower part shows marks of fire. The gable ends too appear to have been raised to give the roof a higher pitch. At the farm-house adjoining the barn was a small cottage, formerly a chapel, but it has been some time removed. This property belonged to the Abbey of Kingswood. At the dissolution of monasteries it was granted to the family of Poyntz, who alienated it to the Estcourts."

The party reached Beverstone soon after one o'clock, and Mr. Garlick having kindly offered his lawn and any accomodation his house afforded, luncheon was soon improvised under the shade of the trees, after which they proceeded to explore the ruins of the ancient Castle. These ruins are little known beyond the district around Beverstone, but will amply repay a visit. Some portions of the buildings are well preserved, and the arch-way, guard-room, and warder's lodge, forming the principal entrance are nearly entire. From the top of the south tower an extensive view is obtained over the surrounding country. Here Mr. Playne read the following paper.—

Notes on Beverstone Castle by Mr. Playne.

"The ruined Castle at Beverstone is interesting,—in the first place, as illustrating by its history several important epochs in the general history of our country, and secondly for its ecclesiastical remains.

Before calling attention to the accompanying plans of the two chapels which still exist in the north-west tower, I will briefly state a few particulars of the history of the Castle. In giving these historic details I pretend to no original research, but merely collate from our county historians, Atkyns, Rudder, Bigland, and Fosbrooke.

A Castle appears to have stood here in the reign of King Edward the Confessor, for it is recorded that about the year 1050, Earl Godwin and his sons, in rebellion against the King, raised a great force and took up their quarters at Beverstone, and some of the accounts expressly state that they seized the Castle. The manor of Beverstone belonged to the nunnery of Berkeley, but King Henry II. gave it to Robert Fitzhardinge. Maurice de Gunt, grandson of Robert Fitzhardinge, was prosecuted for fortifying his Castle of Beverstone without license in the second year of Henry III (1217), but he obtained license two years later. Maurice de Gunt dying without issue, the Manor of Beverstone passed to the family of De Gourney, and subsequently to the family of Ap-Adam, and was sold by Thomas Ap-Adam to Thomas Lord Berkeley in 1329. The Castle had probably become dilapidated during the wars of the Barons, for Thomas Lord Berkeley made such great additions to it as to render it in effect a new structure; expending on this work moneys he had gained for ransom of prisoners taken at the battle of Poictiers (1356). The Castle he built was square, with a tower at each corner, and it was moated on all sides. In the great civil wars, Beverstone Castle being garrisoned by the King's forces, was attacked by Colonel Massey with 300 foot and 80 horse without success; but the Governor being taken prisoner and carried to Gloucester, Colonel Massey learnt from him where the Castle might be attacked with the greatest advantage, and advancing against it he summoned the garrison to surrender. The Lieutenant who held the command, immediately complied, though it was thought he might have held it with ease. The Castle was destroyed by fire soon after the siege, and a large dwelling-house built within the walls was likewise burnt down; and that which was rebuilt is the present farm house. This Castle is a model of a moated baronial residence. So much of the moat is traceable at the present time that the size of the 14th century castle as built by Thomas Lord Berkeley may easily be ascertained. The moat remains on the west, the south and half of the east side. The area it enclosed was less than 150 feet square. Of the buildings, there remain the gateway—situated within the moat at the middle of the east side, and the whole of the buildings forming the west side of the Castle, and here, in the south-west towers are situated the two chapels, shown on the accompanying plan. The larger chapel occupies the second story; it is 27 feet 6 inches long, and consists of two parts: a square compartment, which has a handsomely-groined roof with carved bosses at the intersections of the groins; and the eastern part, 14 feet wide and 9 feet deep, which has in its south-west angle a piscina, and on the south side fine sedilia of two seats, the handsome canopies of which have been sadly mutilated. In the east wall there is a three-light window, with tracery similar to that in the east window of the chancel in the neighbouring parish church. The architecture of the chapel is of 14th century work. The present west window, as well as several other windows and fireplaces in various parts of the Castle, are evidently insertions of the 16th and 17th centuries. In the adjoining passage the walls are pierced with narrow slits.

The second chapel is on the third story, and is only 11 feet 4 inches long, by 7 feet 5 inches wide; but its small size did not prevent a large number of persons from participating in the services there celebrated, for both the side walls are pierced with "squints" in such a manner as to enable the occupants of the adjoining apartments to see and hear the celebrant. These squints could be closed on the outside by shutters, the hinges for which yet remain. This small chapel has a piscina in the south wall and was lighted by an east window, apparently circular, but now filled in with later masonry, containing a square-headed window. Underneath the small chapel is a chamber, where, by an aperture in the floor, 3 feet 6 inches by 3 feet in size, and a shaft some 30 feet deep, there was a communication with a dungeon, about 9 feet square, situated low down in the foundations of the castle, lighted by one small window only. If this was used as a prison, and the only access was by this shaft, a more horrible abode can scarcely be conceived. At present the shaft is choked by rubbish, and access has been gained to the dungeon by an opening broken through a massive wall, and this cell is now utilized as are all other parts of these ruins, in connection with the adjoining farm house.

The south-west tower, in which the chapel and dungeon are situated, is connected with the tower at the north-west angle by a wall and many passages. This north-west tower is set angle ways, so as to command the north and west sides of the castle, and was divided into three (?) floors, now fallen in.

The walls of these are cracking in many places, and give signs of such weakness, that 'ere long, some of the details which to-day we examine with so much interest, may be numbered amongst the things of the past."

The next object of interest, was the Parish Church of Beverstone, over which the visitors were conducted by the Curate, the Rev. W. H. Kemm. The Norman work and some old inscriptions were examined, and a parish register dating from 1565 was pointed out as an object of curiosity.

Leaving Beverstone, the Club visited the quarries near Chavenage, and the Great Oolite with its subdivisions of Bradford Clay and Forest Marble were pointed out by Mr. WITCHELL, who drew attention to the great benefit the district derives from the beds of Bradford Clay. These beds, three in number, and each about a foot in thickness, are the water-bearing strata throughout the district, and but for them no ponds or pools could be maintained except at a great expense, and no water could be obtained except from wells 80 or 100 feet deep, and sunk in the solid rock. The "shelly beds" of Minchinhampton are here represented by a single bed, and the "white limestone beds" of Bussage and Sapperton have thinned out and are altogether wanting.

After Dinner at the White Hart, Tetbury, Professor CHURCH called attention to some experiments he had made with the clays of the "Forest Marble," and he regarded the Bradford Clay, as similar in character. He found that the percentage of Carbonate of Lime in the Clay was greater than in the Forest Marble. He then referred to the clays found in the fissures of the rocks in the district, upon which he had likewise experimented, and the result showed that these clays differed entirely from all other clays in the district.

Mr. WITCHELL was of opinion that the clays found in the fissures were formed of glacial mud, and he mentioned having discovered in it small pieces of iron, quartz and other pebbles, and some small pieces of Mammoth bone.

Further experiments were promised by Professor CHURCH, the results of which will be communicated to the Club.

This was the last meeting of the Club for the season. A suggestion had been made by our Vice-President Dr. Wright, that we should have an Autumn Meeting, and Lyme Regis had been named as the rendezvous. But Autumn Meetings are notoriously difficult to accomplish—and so it fell out that the plan fell through—to the great loss I feel satisfied of those Geologists who never having visited that magnificent section lost an opportunity that may not readily recur of enlarging their knowledge with the aid of a guide so competent as our accomplished Vice-President to read and interpret the teachings of that incomparable succession of beds, which once seen will never be forgotten, and without seeing and studying which, no one in England can form an idea of Liassic Geology.

On some Skeletons discovered at Barber's Bridge, near Gloucester, in 1868. *Read at a Meeting of the Cotteswold Club, on the* 5*th April,* 1871, *at Tibberton, by* CAPT. PRICE.

IN the Spring of 1868, a gang of men were employed in taking off the crown of the hillock *on which we now stand* for the purpose of filling up a pool which, at that time, lay at its base. In the course of the work a number of skeletons were discovered lying side by side at a depth of from 18 inches to 2 feet below the surface of the ground; 86 in all were exhumed, and the remains re-interred in one grave on the spot. Various attempts were made to account for the presence of so many bodies in this field. It was known that, in the latter part of the last century, when the canal was being excavated, a number of bodies were also discovered close by, but no explanation was given of the circumstance, excepting that they were assumed to be the bodies of men who had fallen in some of the many skirmishes which took place in this neighbourhood during the civil wars. The foreman of the works at that time lodged at a house occupied by the daughter of an old blacksmith, named TAYLOR, who had died a year or two before, at the age of 97. Having heard that enquiries were made respecting these bodies, she told the foreman that they were the remains of Welshmen, who had been engaged in the Siege of Gloucester, and had been slain on the spot: that when she was a child, she was in the habit of passing through this field with her father to visit relations in Hartpury, and that he had often pointed out the spot to her as that on which these Welshmen had been buried: that she perfectly well remembered being always afraid, in consequence, of passing through this field alone at night: and that she had often heard her father say, still more recently, that, if ever the mounds were disturbed at Barber's Bridge, there would be found the bodies of many soldiers who were killed down below by the brook side, and brought up there to be buried; that they were Welshmen who had fought at Highnam, and had been driven back, and met at the brook by another body of soldiers, and there surrounded and killed; that there was no bridge over the brook then: that the bridge had been built in his lifetime: that he had been told by his father, that his grandfather was an eye-witness of the fight. This woman—HANNAH TAYLOR, died in the early part only of last month, but has frequently repeated these statements, invariably closing them with these words "they were Welshmen, and they were very fine men."

A stirrup, discovered under the bridge, on the site of the ancient ford or passage across the brook, and which it was natural to suppose was in some way connected with the other remains, seemed to point to an earlier period than the civil wars. The Society of Antiquaries, to whose inspection it was submitted by Mr. NIBLETT, however pronounced it to be of the 13th century (see their proceedings of June 30th 1867, page 529). A cannon ball and some few buckles and buttons, however, which were discovered with the skeletons have been pronounced to be of a more recent period; and further enquiries were therefore directed to the local histories of the Siege of Gloucester.

Shortly after this two old men SAMUEL COLWALL and CHARLES SMITH, at that time both of them living in one of the Tibberton Alms Houses, of whom only the former now survives, confirmed the statements of HANNAH TAYLOR. COLWALL said that his father worked in the construction of the Canal, and that the bones discovered at that time were said to be the remains of Welshmen who came up to besiege Gloucester for the King: that they were entrenched at Highnam, and attacked the gate which then stood on Westgate Bridge, but were beaten back; that they fought a battle on Ludnam's Hill, the field in which Mr. PARRY's church now stands; that they were defeated and driven along the road to Barber's Bridge, where they were met by fresh troops and cut to pieces; that their "trenchments" were to be seen when he was a boy, and he believed were still to be seen in the wood, on each side of the Newent road, near the three mile stone on the "point of the hill": that he lived for many years at Highnam, and afterwards with his father at a house in Highleadon, known as the Camp House, now the property of Mr. Ellis, of Minsterworth, and has often heard that soldiers formerly "camped" round that house at night, and were posted at the brook by day, and that the brook was called Red Brook, as it still is at and below the bridge, because it ran red with the blood of the slain. As SAMUEL COLWALL is still living close at hand, he will be able to confirm these statements if seen at the alms houses, but he is not able to get far away from home. In the material facts he was confirmed by SMITH who lived and worked at Highnam when a boy, and remembers when the turnpike road was diverted at the Cross Hands about 40 years ago, that many bones and buttons and other relics were discovered in the excavations. There was now very little difficulty in connecting these remains with the Welsh army under Lord HERBERT, which was encamped at Highnam, and defeated and captured there by the combined forces of MASSEY and Sir WILLIAM WALLER, on the 24th March, 1643. ARCHDEACON FEARNEY in his manuscript in the Bodleian Library, at Oxford, relates a conversation he had in 1717, with a Welshman who had served in this army as a boy, and SAMUEL TAYLOR's father, who died at a very advanced age, might have been living at that time. When the bones were found in cutting down the hill to form the Canal embankment, but little more than 150 years had elapsed since the surrender of the Welsh army, and men of the age of SAMUEL TAYLOR at his death, and even men no older than my informants in the alms houses now may well have related in 1795 the details received by them from eye witnesses of the events of March 24th, 1643. The fate of this Welsh army is locally recorded in "CORBETT's Military Government," and it is officially recorded in Sir WILLIAM WALLER's letter to both Houses of Parliament, both of which are reprinted in the Bibliotheca Gloucestrensis at pages 29 and 195. The latter is printed in the Journals both of the House of Lords and House of Commons, as well as in the tract from which the Bibliotheca Gloucestrensis has reprinted it. It is a singular circumstance that neither of these records speaks of any serious loss of life on the occasion, though there is abundant evidence from other sources that there was a loss variously stated at from 300 to 600 men. Neither is any loss of life mentioned in the account of these transactions given in the historical introduction to the Bibliotheca Gloucestrensis on page 36. This, however, seems to have been in great measure compiled from CORBETT's narrative, and therefore would contain no facts that were not recited by CORBETT himself. CORBETT does not say that a single man was killed in the two days fighting, and, speaking of Sir WILLIAM WALLER's attack, he says that "after his approach not a man of the enemy was slain or hurt." Sir WILLIAM WALLER himself says in his official report, "in a short time without the losse of above two, they rendered up the place upon "quarter." It is difficult to reconcile this statement with the abundant evidence which may be adduced of a very heavy loss, but as one of the most detailed accounts which will be presently quoted, attributes the slaughter to an act of treachery on the part of Sir WILLIAM WALLER; an allegation constantly repeated and nowhere refuted at the time, it is probable that CORBETT was discreetly and charitably silent on the subject. He was MASSEY's chaplain, and MASSEY was a conspicuous actor in the scene.

In the Biographical and Historical Memoir of CORBETT published in the Bibliotheca Gloucestrensis, the following passage occurs. "Hence it will be found that, whilst the main facts of CORBETT's military relation are incontrovertible, his statement, if not generally corroborated by the testimony of contemporary writers, is at least not invalidated by any Historian of those perilous days." Some inaccuracies in CORBETT's statements must clearly therefore have been within the knowledge of the writer of this memoir.

It may be convenient here to read Sir WILLIAM WALLER's official letter to both Houses of Parliament.

"MY LORDS AND GENT.

"We hear it is not wel taken, that you heard not of the taking of the Welsh at Highnam, nor of the losse of Malmsbury. Upon our coming to Gloucester, we immediately sent; it seems many of our letters miscary; for Malmsbury we committed it to Sir EDWARD HUNGERFORD: we left him not without commanders, he had two Sergeant Majors, able men, and the Companies of his own regiment, and a Company of dragoones, with ammunition and two hundred muskets, to put into the Countrymen's hands, that offered themselves very freely: We conceived that Sir EDWARD HUNGERFORD's power in the country, with that strength, would easily have defended that place. But for reasons best known to himselfe, he quitted it. It was not for us to have stood long there, nor for the advancement of your service nor for us to garrison towns, unless it is intended we shall leave the field. From Malmsbury, marching day and night we came to Framelet ferry, and having our boates from Gloucester readie, we passed our army over Severne, and forthwith to Huntley, and so to Highnam, where, before the enemie had any notice, we fell upon their backes, and in a short time, without the losse of above two, they rendered up the place upon quarter, where he had one thousand foure hundred and forty foure common prisoners well armed, commanders and gentlemen about one hundred and fifty, many of the chiefe of Wales and Herefordshire."

As this letter makes no allusion to such a loss on the part either of the Parliamentry, or of the Royal Forces, as would account for the number of bodies found at Barber's Bridge, and, as the local tradition seemed to connect these bodies so very directly with the battle at Highnam, information was sought from other merely than local sources, and chiefly from pamphlets and newspapers of the period, of which a large collection exists in the British Museum. It was the more important to refer to these as even Sir WILLIAM WALLER's report, as printed in the Journals of Parliament, cannot be fully relied upon.

In "*Mercurius Aulicus,* or *Court Journal*" of 20th April, 1643, from which further quotation will be given, the following passage occurs:

"It was advertised from London that a letter from Sir WILLIAM WALLER (wherein he makes great mention of his victories, but none of his losses) was by the House ordered to be put in print, but with such alterations and omissions as Sir THOMAS BARRINGTON should think most expedient to advance the cause."

It is clear therefore that we cannot rely either upon the statement of CORBETT, or of Sir WILLIAM WALLER himself.

The chief newspapers of that day were the *"Perfect Diurnal* or *Parliamentary Organ,"* the *"Mercurius Aulicus* or *Court Journal,"* the former published in London, the latter in Oxford; the *"Kingdome's Weekly Intelligencer,"* the *"Continuation of Special and Remarkable Passages," and "Certaine Informations,"* with some others of lesser note. Copies of these were carefully examined in the Library of the British Museum, and especially in the very remarkable collection of newspapers and tracts, known as the "THOMASON Collection" presented to the Library by George III. These seem to have been most carefully got together from day to day as they came out, and several of the extracts which follow are taken from the volume sent by THOMASON to Charles I, at Oxford, and which fell from the hand of the King when mounting his horse. This fact is duly recorded by THOMASON himself on the fly leaf and the cover, and many of the pages are stained by the mud of the road.

The two following extracts are from the *"Perfect Diurnal,"* March 27th to April 3rd, 1643.

"And so having intelligence that the Lord HERBERT was gotten into Gloucestershire with some considerable forces of Welchmen, and has come over the River of Severne to a place called the Forest of Deane, (where they began to make worse havock than Skimington did, not long since, in the same with a tumultuous crew); the said Sir WILLIAM, when they expected his coming to Cicester, advanced with his forces towards Deane, and fell upon the Lord HERBERT's forces there, and Colonel MASSEY who is Governor of Gloucester, coming also with two or three regiments from thence upon their arreare, it is informed that about 600 of the Welchmen were slaine, and 1000 taken prisoners and all their colours, arms, and ammunition taken."

"By letters from Gloucester it is for certain informed that Sir WILLIAM WALLER hath lately given the Welch forces before Gloucester a very great defeate, which is said to be after this manner: Sir WILLIAM with his forces coming neare Cicester made show, the better to conceale his purpose, as if he intended to fall upon the towne, but his ayme was at Gloucester, and had so ordered the business that Gloucester men had notice of his intent; and that with the help of his flat bottomed barges, which he carrieth along with him in the nature of waggons, and are very useful both by land and water; he would transport his forces along the River of Severne past Gloucester, and fall upon the reare of Lord HERBERT'S Welch forces when they should the least dread him, and withall gave the Gloucester forces notice when they should fall upon the front of the Welch Army, as he would upon the reare, which designe was no better plotted than it tooke effect; for when the Lord HERBERT was in skirmish with the Gloucester forces, upon their comming out to him with full thought to cut them all off, being so few in comparison of his, Sir WILLIAM WALLER brought his forces neare the Forest of Deane, and fell upon the reare of them with such fury that the Welchmen soon shewed their Welch valour, and would gladly have tooke flight if they had known which ways to escape them. Sir WILLIAM making such havocke amongst them that there was slaine, as is conceived, at least 500 in the place, neare 1000 taken prisoners, with all their arms and Ammunition, and the rest of the forces wholly routed, the Lord HERBERT, as was at first supposed to be slaine, for that he could not be found; but it is since informed he got away and fled to Oxford, leaving all his Welchmen behind him, which make them swear by Saint Taffie, they'll never fight for him againe, unless he passe it under his hand and seale he will stand it out."

These two extracts are from the "*Parliamentary Organ.*" That which follows is from the "*Mercurius Aulicus,*" which was the organ of the King's party. The loss is here fully admitted, although it is accounted for by an allegation of treachery against Sir WILLIAM WALLER.

"This day was taken up in scouring and examining the reports which came from Gloucester, touching a blow said to be given by WALLER to the Lord HERBERT'S forces neare that city, which being first noised to be a total overthrow of that little army, and after confidently affirmed to be nothing, but rather that they had the better and repulst the enemy, ended at last in this relation; that the Lord HERBERT had entrenched his forces at a place called Hineham, on the further side of Gloucester, beyond the Severne expecting forces to come down from the hither side and so block it up. That WALLER, perceiving the co-operation of the King's other forces with those at Hineham would be a great danger to the Towne passed over the Severne secretly, at a place called Newnham, about Friday, and fell upon the back of the Lord HERBERT'S quarters, who then was at the Court, but met with such resistance that there he *lost* 400 *of his men*, and so gave over for that time. Finding the next day that the King's forces were willing to admit of parley, he hearkened to it, and entertained a treaty with them, having lost so many of his men in the former onfalls. But while they were upon debate of the conditions and almost come to a conclusion, some of the men perceiving *one of the outworkes* to be but meanly manned (most of his Soldiers being withdrawn in confidence of some faire end by the present parley), gave in upon the same and wone it, and from then set upon the rest: that the horse, both troopers and dragoons, seeing how little hope there was of safety if they should abide it, went fairly off and saved themselves for better times, leaving about 300 of their foot behind them, who were had prisoners into Gloucester, besides 300 or thereabouts which were killed in the defence of the works. This is the sum of the intelligince as near as possible I could collect it.

The following extracts are from the *"Kingdom's Weekly Intelligencer"* of Tuesday, 28th March to Tuesday, 4th April, 1643.

"But I hope I shall supply that defeat with a successe in another place of far greater consequence, by Sir William Waller against the malicious Welchmen, who while he gave out he would take in Cicester and Tewkesbury before he marched against the Lord Herbert, in the night time diverted his course, and having a bridge ready provided of boats which the Earl of Essex sent to Gloucester when he was at Worcester, and marched over the brave river Severne, and fell upon the reare of the Lord Herbert's Welsh forces, whilst the Gloucester men came in the front and slew neere upon six hundred on the place, and tooke above one thousand prisoners, and neere two thousand armes, besides the Lord Herbert's long guns, and other Engines of War. But a more particular relation hereof you shall have in the conclusion of this week's intelligence."

"Whereas it was mentioned a particular relation should be made of the manner of the defeat given to the Welsh in Gloucestershire, the parties that holds a weeklie correspondence thence hath not writ, or rather his letter is miscarryed. But so many letters are come to London to Merchants and others of the truth of that fact, that there is no doubt of it. Some of the letters speake of but three or four hundred at most that were slaine, but all agree in the taking of one thousand three hundred prisoners, and two thousand arms, and one hundred gentlemen commanders of great qualitie in Wales and most Papists."

The following occurs in the *"Continuation of Certain Special and Remarkable Passages:"*—

"The great overthrow given to the Welch army before Gloucester, by letters from thence on Monday last, was more fully confirmed to this effect, dated the first of April.

"Sir,

"I presume the Report of Sir William Waller, his good successe against the Welch is very common with you, yet, least you may not have full information of the truth, I have made bold to insert upon assured knowledge. Sir William, pretending when he went from Malmesbury to fall upon Cirencester, sent hither all his prisoners whereof one hundred have taken oath to fight for the King and Parliament, and are entered into pay, but Sir WILLIAM made towards the Forest of Deane, and give passage over the River made made use of 30 boats that were intended for service at Worcester, and with them made a bridge over Severn, and so marches forcing his passage through the Forest to Highnam, a place were the Welch forces were intrenched, and fell upon the reare of them, while other forced out of Gloucester fell upon the front, and so encompassed them, slew many, tooke 1326 prisoners, 500 horse, with neere a hundred commanders, since which overthrow given to the Welch some other of the King's forces tooke a troope of Sir WILLIAM WALLER's horse, but he soon recovered it again, and above 51 horse more of theirs, nine hundred pounds in money and store of victual sent in by the country."

"The letters from Oxford do confesse the defeate at Gloucester very little less than is before related."

The following extract is from number 36 of the "*Continuation of Special and Remarkable Passages:*"—

"By letters out of Gloucestershire it is informed that Sir WILLIAM WALLER slew (as has formerly been alluded to) about 500 Welshmen, and took at least 1000 prisoners, 1600 arms and 4 pieces of ordnance, there being about 100 officers, with great store of horses and other provisions for war; the Lord HERBERT'S own troop being taken, which consisted of 100 brave horses, many of them having been long provided by the Earl of WORCESTER, the Lord HERBERT'S father, divers of them being valued at a hundred pounds a horse. Sir WILLIAM WALLER marched to Tewkesbury, which the King's troops evacuated at his approach, and went to Worcester."

The following extracts are from "*Certaine Information,*" of March 30th, No 11, and Friday March 31st:—

"And though Sir WILLIAM WALLER made show of falling upon Cirencester, the more to amaze and detain the cavaliers there to defend it, yet he left that town and marched directly towards Gloucester, where boats were ready to convey him and his army over the River of Severne into the Forest of Deane, and being got over the river he wheeled about and came upon the reare of the Lord HERBERT'S Welch army that have a long while besieged that city on the west side of it, the Garrison in Gloucester being appointed to sally out and fall upon the front of them; so that between both, the miserable seduced Welchmen were taken in a toil and cut off without any great resistance; there were between foure and five hundred of them slaine upon the place."

"This day further information came out of Gloucestershire concerning the late defeat given to the Lord HERBERT'S Welch army that besieged the City of Gloucester, as namely—that Sir WILLIAM WALLER tooke about 1300 of them prisoners, slew nearly 600 of them, and also that he took about 1500 armes, the most of their muskets being neere upon a foot longer than all ordinary muskets are; that amongst the Welch were found many women which had knives near half a yard long to effect some notable massacrees with them."

The account of this engagement is also given in a little book published in 1647 under the title of "England's Worthies", at page 79:—

"He also, most undauntedly (with the help of renowned Colonel MASSEY then Governor of Gloucester) set upon 2000 of the King's Welsh forces in the Forest of Deane under the command of the Lord HERBERT, beat them out of their trenches, slew about 600 on the place, took 400 of them prisoners, took 6 troopes of as brave horse as all England could shew; almost all their armes and ammunition, together with 5 pieces of ordnance."

Mr. SKILLICORN has in his possession a little tract published in the year 1643, the title being:—

"A famous victorie obtained by Sir WILLIAM WALLER against the Lord HERBERT and the Welch Cavaliers in the Forest of Deane, in the County of Gloucester, where six hundred of the Welchmen were slaine, and a thousand taken prisoners by the Parliament Forces, the said Lord HERBERT, General of South Wales being slain;

And from it is taken the following extract:—

"And to make this intended victory (which was afterwards obtained) the more complete, Sir W. WALLER gave notice of this designe to Col. MASSEY, who is Governor of Gloucester, with directions for him at such a time to issue forth with a considerable party from thence on the other side of the river, being the time which he intended to fall upon the Welch forces; which businesse on both sides being pursued with effect (according to the most certain relation) fell out to be thus:—

"Sir WILLIAM WALLER suddenly returning from about Cicester, and with a speedy march coming to Deane, fell upon the Welchmen, who at the first seemed to make strange of running away and therefore for a while fought very manfully till about six hundred of them were slaine, and nee a thousand taken prisoners, so that very few could escape to the mountains to bring tidings of her countrey's valour."

The two following extracts from the "*Mercurius Aulicus*" of March 29th, 1642-3, and April 2, 9, 1643, show that WALLER was charged with treachery and perfidiousness in his attack on the Welsh intrenchments:—

"News also come this day that Sir WILLIAM WALLER having by his perfidiousness and treachery beaten up Lord HERBERT's quarters as before was stated had marched on Tewkesbury, which he took and pillaged."

"It is affirmed also that the Lord HERBERT'S forces are much increased and greater farre than they were before, the Welshmen comming on unto him with great courage and readinesse in hope to be revenged on WALLER for his perfidiousness and treachery showed to their Countrimens at Hincham."

The following extract is taken from *"God on the Mount,"* published in 1646:—

"To make his victorious name and fame yet more complete and full, he, (about the latter end of March) advanced his forces toward Cicester, but made no attempt against the said town (aiming at a greater victory which he would not neglect for the taking of such a poor placed and even flead town, and therefore of so small importance), but only faced it. And whilst he seemed to look on the Town he suddenly wheeled toward the Forest of Deane, where the Lord HERBERT lay with about 2000 Welshmen who came over the River of Severn at Rossbridge. Now Sir WILLIAM WALLER had given notice of his designe to Colonel MASSEY, Governor of Gloucester Town, with directions unto him at such a time to issue forth with a considerable party from thence on the other side of the River being the time when he intended to fall upon the Welsh forces, which business on both sides was pursued with singular good effect, for, as I said, Sir WILLIAM returning suddenly from about Cicester, and with a speedy March coming to Deane, fell most resolutely on the Welshmen in their quarters, who at the first seemed to make strange of running away, and therefore for a while fought pretty valiantly till about 600 of them were there slain on the ground, and at least a thousand of them were taken prisoners so that very few escaped to carry news of the mountaines of her Countrymen's valour."

Many other extracts might be given to the same effect, and the Historian of the period—Rushworth—gives as will be seen below, an account in all respects similar to the foregoing, in volume 2, page 263:—

"About the same time the Lord HERBERT, son to the Marquess of WORCESTER, with a considerable army of Welchmen, lay near Gloster and almost blocked up that City.

"WALLER with his forces advanced to Cirencester, and made show as if he would fall upon that town. But the design was for Gloucester, of which he gave the men in Gloucester notice, who supply him with flat-bottomed boats, wherewith he suddenly transported his forces over the river Severn beyond Gloucester, and fell upon the rear of the Lord HERBERT'S Welch forces; whom at the same time a party out of Gloucester charged on the front, whereby there were about 500 of the Welch slain upon the place and 1000 taken prisoners." *Rushworth*, part iii., vol. ii., cxi.

The outline of a field work may still be clearly traced on Ludnam's Hill, near to Mr. PARRY's church, and two cannon balls found on or near the spot, and still in Mr. PARRY's possession, together with the relics discovered at the Cross Hands, when the road was diverted, sufficiently identify the site of the battle referred to by SAMUEL COLWALL, and the trenchments which he described on the Newent road, near the three mile stone, are obviously those thrown up to command that road, as recorded in the Bibliotheca Gloucestrensis, page 34.

The events of the 24th March, 1643 are thus sufficiently established, 1st by Local Traditions; 2nd by Historical evidence; 3rd by Existing and recently discovered Relics of the Fight.

It is true that the tragic scene which has been supposed by some to have given its name to the Bridge is not amongst the historical details we yet possess, but an unbroken tradition, and the relics tell the same tale, and are supported by legitimate inference drawn from such facts as may be considered to be established.

It is also true that the name of Rudford nowhere occurs in the records, but SAXTON's map, the only one which could have been in use does not place Rudford and Highnam in such juxtaposition as to require that it should be mentioned.

Waller tells us himself in his letter that he crossed the Severn at Framelet Ferry, and forthwith to Huntley, and so to Highnam. Now he could only have approached Highnam from "Framelet" by way of Huntley for the purpose of getting round and behind the Welsh army, which was thus taken in a trap—for with MASSEY in front, the Severn on the one side, and the Leadon on the other, it was only necessary to possess the Ross and Newent roads, and there was "no ways to escape them." To effect this object WALLER had only to march part of his force from Huntley through Tibberton to the Newent road, about three miles. But the old road, which is still used as a farm road, would bring him straight to the little hillock, now much reduced in height (having been first cut down by the Canal Company and since by the present owner,) which commanded the Highleadon passage, and on which the skeletons were found. The Welsh were scarcely likely to have left this passage ungarded; it was their line of communication with Wales. If held by any considerable force, WALLER could not have left that force in his rear when marching to the attack on Highnam; and here, perhaps, occurred that resistance on the first day, which, according to the "*Mercurius Aulicus*," cost him 400 men.

But even if the Welsh had relied on their entrenchments above the three milestone, WALLER was not likely to overlook the strategic importance of a position which would enable him to intercept the retreat of an enemy he must have felt confident he was about to put to flight, and the occupation of which by him would explain the disaster said by the old blacksmith to have befallen the Welsh on their retreat from Ludnam's hill. That Highleadon Passage was a point of strategic importance at that time may well be conceived by those who know it now, and as it would be if unbridged, and if it had not been so, CORBETT would not have thought it necessary to tell us, in describing the march of MASSEY to Hartpury, in 1645, that "late in the afternoon our party began to advance, and at Highleadon Passage got over the Brook."

Moreover, the tradition handed down through SAMUEL COLWELL would seem to show that the encampment at Highleadon was established chiefly for the protection of this passage, though it was only held in force by day.

It is submitted, therefore, that beyond all question the skeletons at Barber's Bridge, or at "Barbarous" Bridge, as some suppose the original name to have been, are the remains of such of the Welsh army as perished in their fight on 24th March, 1643, and though the original letter of Sir WILLIAM WALLER to both Houses of Parliament, as corrected by Sir THOMAS Barrington, and in which no doubt further details were given, has not yet been discovered, it is possible that it may still exist among the large number of letters and papers belonging to the period which have recently been found in the Victoria Tower, at Westminster, and which were saved when the Houses of Parliament were destroyed by fire.

The only question would seem to be whether the remains may not be those of the 400 men said to have been lost by WALLER himself, the first day, as stated by the "*Mercurius Aulicus*" but the tradition through the blacksmith's family, that they were Welshmen is very precise, and as many other bodies have been found in Rudford Curchyard, and beneath the Chancel of the Church, which were evidently the harvest of some battle field; it is possible that these may have been the remains of WALLER's men, and the others the remains of the Welshmen, especially as the victors would in all probability have shown the preference to their own dead, and have buried them in or near the church.

Notes upon the Physical Structure of the Watchett area, and the relation of the Secondary Rocks to the Devonian series of West Somerset. *By* Robert Etheridge, F.G.S., F.R.S.E.

Perhaps no area in Great Britain exhibits so extensive a series of Lower Secondary Rocks, as West Somersetshire and Gloucestershire, more scattered in the former than the latter, owing to circumstances dependant upon physical structure and local conditions, or expression of cosmatical causes and effects, which to be understood must be seen and carefully examined; the grandeur of the West Somerset coast and its geological structure as seen between Little Stoke on the east of Quantocks Head, and Greenlay Point west of Minehead in the Bristol Channel, must be examined in detail ere the remotest idea of cause and effect can be appreciated; the expanse of water occupying the estuary of the Severn (some 14 miles) from the Somerset to the Glamorganshire coast, comprises an area once a continuous and great plain of New Red and Lias, surrounding high lands composed of Devonian and Carboniferous Rocks stretching locally from the Mendips on the north-east to Exmoor and Dartmoor on the west and south-west, with the south flanks of the South Wales coal basin and the Old Red Sandstone of Monmouthshire as its northern frontier. The vast alluvial flats of Somerset east of the Quantocks now cover up these secondary rocks as far as Clevedon, Bleadon Hill, Bream Down, Mole Hill, and Middlethope, *three* parallel ranges of Carboniferous Limestone (inland islands) now attesting their deeply seated connection with the Mendips, Broadfield Down and Clevedon, as outliers from the main masses; the steep and flat Holmes midway between the English and Welsh coast, bridge over to Barry Island, the once continuous subærial (now subaqueous) Limestones and Old Red Sandstone; the waters of the Severn now taking the place of the New Red Marls and Lias, and is still the denuder and destroyer of the Rocks we have to elucidate in this notice.

A line drawn from Greenlay Point on the west, to East Brent on the east, describes a line of coast unparalled as regards Physical Structure and Geological intricacy in the Lower Secondary Rocks of Britain; the lowest known exposed secondary deposit within the area is the Bunter Sandstone and the so called Dolomitic Conglomerate which flanks the older series of the Quantocks, Exmoor, and Mendips. *Nowhere* are *these* seen on the coast, the Gypsiferous or new Red Marls only of this series are exposed in the cliffs east and west of Watchett, and which are again thinly covered west of Doniford by patches of the Rhætic series and Lower Lias. East of the brook which then flows into the sea, occurs an unexampled section of Upper New Red, Rhætic, and Lower Lias in one continuous series, all conformable, and having one dip to the south-west. The entire section measures 295 feet to be hereafter described. From St. Audrey's Slip to Quantocks Head, the coast is entirely occupied by the New Red Marl, an extensive fault at Quantocks Head throws down the Lias to the base of the Bucklandi and Lima Beds; and these abut against the New Red, the anticlinal being seen on the shore, then follows along the coast the finest succession of the Lower Lias I know; being indeed a continuation in sequence of the Doniford beds; 93 feet of the Bucklandi series are here shown in succession, Lima gigantea, L. Hermannii, Gryphæa arcuata, Rhynchonella variabilis, Ammonites angulatus, Ammonites Bucklandi, Am. Conybeari and other characteristic Lower Lias species occur abundantly at the base. At the top of this series the beds are faulted, and many apparently lost; then follow 13 beds of Argillaceous Lias (Cement Beds) in all 30 feet thick, these are succeeded by 50 feet of pale, yellow, and grey Argillaceous Limestones, poor in fossils, then at a low angle of dip 200 feet of Shales and Limestones are exposed, occupying a long shore line. A succession of faults (4) destroys all true sequence upwards, as far as Kilve Pill.

At this spot the Bucklandi beds are again brought or faulted to the surface, and about 130 feet exposed, this series is however also much disturbed, and continues so on to Little Stoke Point, where a reverse dip occurs, apparently from a north and south fault, and the influence of those which also traverse east and west and which to the east, by 3 or 4 parallel upthrows, bring the New Red Marls to the level of the Lias; this it is which also brings in the Rhætic Beds in great force east of Little Stoke. The following section, No. II, made in the year 1865, will shew their significance. At Watchet, and two points east of it, the Rhætic Beds are well developed, but under different lithological conditions, only the *Lowest series* are exposed (Red and Grey Marls, &c.) with some Black and Gypsiferous Marls. The higher series containing *Avicula concorta, &c.*, seem to be in place to the north at the sea level; it was from this lower series west of the Harbour that Mr. Dawkins obtained Microlestes *(Hypsiprimnopsis)* Rhæticus, the earliest known genus of Mammalia in the British Rocks.*

RHÆTIC SERIES OF THE WATCHETT AREA IN BRIDGEWATER BAY.

I have stated that at four localities along the north coast of West Somersetshire, these remarkable rocks appear. It is due to the numerous faults and contortions of the strata that they are not seen continuously along the entire coast from Benhole Farm on the east, to Blue Anchor on the west. The known inland sections are two—St. Decuman's in the railway cutting between Williton and Watchett, immediately south of the Harbour, and Lower Venniford, under Heyden Down and North Hill, 9 miles west of Watchett.

The most important exposure and section is at St. Audrey's Slip two miles east of Watchett. It may be regarded as a typical section corresponding in most of its details with that of Penarth and Lavernock on the opposite coast (fig 2). The extreme eastern part of the section is composed of New Red Marl with 72 feet of alternating grey, green, red and pale yellow, bands of hard and soft Marls (termed *tea-green* marls); these are conformably succeeded by 66 feet of Grey, Brown and Black Shales with many bands of Argillaceous Limestones; the upper portion of those Shales from the White Lias down to the Bone Bed (26 feet) is extremely rich in organic remains. Most of the known Upper Rhætic forms occur through this series; the following Species were collected:

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* *Quarterly Journal Geological Society,* Vol. xx., pp. 528-412.

Avicula contorta
Lima precursor
Modiola minima
Placunopsis alpina
Ostrea intusstriata
Gervillia precursor
Pecten Valoniensis
Cypricardia suevica
Cardium Rhæticum
Pullastra arenicola
Myacites striato-granulata
Myophoria postera
Pleurophorus angulatus
" elongata
Anatina præcursor
" Suessii
" elongata
Annellide tracks
Saurichthys apicalis
" acuminatus
Sargodon tomicus
Gyrolepis tenuistriatus
" Alberti
Hybodus pyramidatus

The capping to the Rhætic Black Shales, by the White Lias, or its representative although differing lithologically from the Pinhay, Saltford, Currey-Rival and other type localities, is here clearly shewn, the Cotham Marble bed being well defined within 16 inches of the Black Shales; its base is much indurated. A small oyster was the only contained form I recognised at St. Audrey's.

The Ostrea series, about 20 feet thick, rests upon the White Lias. They are very fossiliferous, but richer in individuals than in species. The abundant forms are Ostrea Liasica Mod. minima, Lima punctata, and Carpenteria. These and the Planorbis Limestones are the equivalents of the well-known Saurian beds of Street, &c., and contain Plesiosaurus Dolichodeirus, P. Hawkinsi, and Ichthyosaurus.

These Species were obtained from the foreshore immediately west of St. Audrey's slip. A marked feature in the section are the Planorbis Beds, 24 feet in thickness, and in many places crowded with this Ammonite, the shell in the higher portion of the series is replaced by, or converted into, crystallized Sulphate of Lime (selenite), being really Selenitic Ammonites: few fossils occur throughout the series. Owing to the inaccessibility of the cliff at St. Audrey's, the Angulatus and Bucklandi Beds could not be examined, but at least 50 feet are exposed, they are however repeated to the east in the great cliff section at Quantocks head and are nearly 100 feet thick; corresponding almost bed for bed with the opposite cliff sections, along the Glamorganshire coast, from Dunraven to St. Donnats, Porthkerry, and on to Lavernock. The St. Audrey's slip Rhætic series, therefore measured at right angles to their dip, from the top of the New Red Marls to the top of the White Lias equals 145 feet, the Ostrea and Planorbis series, 44 feet, and the Bucklandi beds 50 to 70 feet, making a total of about 250 feet. We thus get in the Cliff section at St. Audrey's the equivalents of the two Rhætic series that occur at Watchett, one on the eastern side of the Harbour, the other on the western, both of which owing to their position are covered at high water, and the beds stand nearly vertical. Fish remains are abundant in the Watchett sections, with a large and characteristic Rhætic Fauna, also immediately, south of the town *in the Railway Cutting* at St. Decumans, and in the line of fault a fine section of the Rhætic beds are exposed, the whole seen being 76 feet in thickness, from the Earthy Limestones above the Pecten Valoniensis bed, to the Sandy Shales and Marls measuring 15 feet and containing many fossils. The lowest beds seen are Grey Marls, which weather brown, the whole of the lower beds of this series are highly calcareous, dense, and chrystalline, and rich in those forms common to the Rhætic Zone.

At Little Stoke, section I, the Rhætic beds are developed with great distinctness, the Black Shales (A.) and underlying Marls (B.) having a marked contrast with the overlying White Lias (C.) and Planorbis beds, (D.) the whole is much faulted, being downthrows to the west. The thickness of the series at Little Stoke is about 80 feet, namely Variegated and Tea Green Marls 50 feet, Black Shales 20 feet, and White Lias 10 ft.

The parallel east and west faults which determine the position of the Rhætic Series at Watchett, are a marked feature along the shore, especially near the Harbour, the southern fault is apparently an upthrow of the New Red and Rhætic Series against the Planorbis beds of the Lower Lias, which are about 50 feet above the sea level, the northern fault is nearly concealed by the sea, and far out on the fore-shore. The great St. Decumans fault is south of these, but parallel—as all the east and west fractures are. This one, however, exhibits no effects along its line or bearing. The known thickness of the Rhætic series in the section immediately west of Watchett, and in which the Microlestes was found, is about 50 feet; that to the east of the Harbour, about 200 feet. The specimens collected by W. B. Dawkins, Esq. from these two sections were submitted to me for determination in 1864. I purpose embodying them with those recognized at St. Audrey's slip, &c. in a tabular form, so as to exhibit the whole fauna at once. I also append the description of St. Audrey's vertical Cliff Section showing succession of the groups as determined a few years since.

St. Audrey's Section.

VI.

The most complete section of the Rhætic series in Somersetshire, if not in the west of England (except Penarth), is perhaps at St. Audrey's Slip, east of Watchet, where the whole series are admirably exposed in one cliff section, ranging from the Tea Green Marls, through the Black Rhætic Shales to the Bucklandi Beds, (the Bucklandi and Lima series.) The Ammonites Planorbis and Ostrea Beds, and the white Lias which cap the shales, and the Tea Green series at the base are all conspicuous in the section.

The details of the Section may be read either upwards or downwards. I purpose, however, briefly describing the groups in upward succession. The measured section *in full detail* was constructed some years since, at a time when the Black Shales were in better order than at present; the sea having made extensive ravages and changes in its aspect.

At the slip, or road from the shore, the uppermost members of the new Red Marls are exceedingly well shown, and also the transitional series called the "Tea Green Marls," which measure

75 feet in thickness; the upper 25 feet of these alternating beds of pale grey, hard and soft Marls, resting upon a few inches of Strontian Marls, the remaining 50 feet are greenish pale yellow and red Marls, which crumble away somewhat rapidly. Upon the upper or Pale Grey Beds rest the Black Shales, which measure 65 feet; the Bone Bed, a very thin band, is 38 feet above the commencement of the Shales, and research failed to detect one nearer the base as in other sections. No fossils were obtained in the 38 feet of Shales below the Bone Bed, except a few Annellide burrows. This excessive developement of Shales below the Bone Bed is peculiar to this area. East of Watchet Harbour they are 43 feet thick below the same horizon; west of the Harbour 46 feet; and at the Railway Section south of Watchett 35 feet; in neither place is the Bone Bed more than 2 inches in thickness, and is everywhere highly comminuted.

Immediately below the Bone Bed there occurs a bed of smooth Argillaceous nodular Limestone, the last in which fossils occur (Cardium Rhæticum and an Axinus). The remaining 40 feet of Black Shales being destitute of organic remains, this is significant, and with the exception of the Westbury or Garden Cliff Section, where the Pullastone Sandstones occur, seems universal in the west of England. All the Black Shales above Bone Bed, I term the "Upper Rhætic," and below to the new Red Marls, "Lower Rhætic," the latter group being nearly 120 feet in thickness, and totally void of organic remains. The Bone Bed is a grey Chrystalline silecio-calcareous Limestone, containing teeth of Saurichthys apicalis, Acrodus minimus and Hybodus, &c. Twenty-seven feet of Black Shales with bands of impure Limestone succeed this Bone breccia in upward succession; as many as seven beds of Limestones occur, between the Bone Bed and the base of the White Lias, all containing the characteristic Rhætic Fossils. Pecten Valoniensis, Cardium Rhæticum, Avicula contorta, Anomia, Anatina Suessii, and Myophoria, &c., being by far the most abundant, and in great profusion.

The White Lias series is 8 feet thick, and well defined; the Cotham Marble Bed at the base being 10 inches in thickness, and is underlaid by 16 feet of grey shales, indurated, and ripple marked. The White Lias is here overlaid by a remarkable series of laminated, slaty, and marly Shales (Pullastra Shales) which weather into cavernous holes. A peculiar species of Pullastra occuring in thousands, constituting the mass of these Shales, 5 feet 6 inches in thickness, they stand between the Ostrea series above, and the White Lias below, a most marked feature in the section. The commencement or lowest bed of the Ostrea series is equally well marked, being a solid bed of hard grey Argillaceous Limestone fissile at the top, and full of Ostrea Liassica and Modiola minima and other shells; the Ostrea beds measure 15 feet, the same fossils occurring through the whole. These are the Saurian beds of the Somersetshire area, and the whole constitute a very definite ridge upon the foreshore, as well as an abrupt facing in the cliff: equally definite and distinct, physically, and palæontologically are the Planorbis beds above, marked everywhere by the Ammonite, giving name to the group of strata here 24 feet thick; of the 24 feet, 16 feet is composed of fissile shales, and in the upper 5 feet the shells of the Ammonites are completely converted into, and replaced by, Selenite. The remaining thick series of Strata, (50 feet exposed,) capping the Planorbis beds, belong to the Bucklandi and Lima series of the true Lias, and which form no part of my paper. They constitute the fine coast line east of St. Audrey's to Little Stoke where the Rhætic beds are again exposed through a series of north and south faults.

SECTION IN RAILWAY SOUTH OF WATCHETT.

No. VII.

When the Railway was first opened, or during its construction, about 70 feet of Shales and Limestones of the Rhætic series were exposed; eight well defined bands of calcareo-siliceous rock occur interstratified with the Black and Brown Shales; the base of the section was not exposed, but the Grey Marls could be discerned in the datum line of railway. The Black shales in this section measure no less than 60 feet, the beds varying in thickness from 5 to 15 feet. I have no doubt this section agrees almost bed for bed with the two sections in Watchett Harbour. Great difficulty was experienced in determining and corellating the three sections, viz. this one, the harbour, and St. Audrey's, owing to the seaward position of the Harbour sections. When first constructed this Railway series afforded me much assistance and information. I append the details, as they were very exactly done at the time, but owing to weathering and vegetation much is now obliterated.

RAILWAY SECTION.

Thirty-two beds of shales and impure Limestones were carefully examined and measured in this Railway cutting, immediately south of the station, and which constituted the entire thickness of the upper Rhætic beds (at least) at that spot. The Grey and Tea Green Marls were below the datum line of the railway. All these beds re-appear again north of the harbour, or north of the east and west fault that traverses the shore, and are of great thickness. The upper nine feet of the section comprises the White Lias, with Pecten Valoniensis in the lowest Limestone band, but does not occur higher. Nine feet of Black Shales with irregular bands of impure Limestone, full of the same shell, underlie the White Lias, and at its base is a bed of hard chrystalline Limestone, which is physically the same as that at Beer Crowcombe, and contains the same fossils. Twenty-seven feet of Black Shales succeed, divided by a band of impure grey earthy fossiliferous Limestone four inches thick, and six feet six inches of Black Shales with a thin band of chrystalline Limestone at their base containing also the Beer Crowcombe species; another set of shales six feet thick with septaria below, and Mr. Moor's flinty bed, and a brown Limestone with fish remains, completes the Section so far as the Black Shales are concerned. At the top of the underlying sandy Marls I noticed, as at St. Audrey's, Annelide burrows and Myophoria; all below was covered by the Railway.

RELATION OF THE KEUPER AND RHÆTIC SERIES TO THE DEVONIAN ROCKS OF WEST SOMERSET.

In *North Devon* neither the New Red, Rhætic or Lias series occur, it is even questionable if they were ever deposited in that area, nowhere west of Porlock are they known. It is evident everywhere that the older or Palæoozic Rocks, both Devonian and Carboniferous were placed in their present general position, prior to *their* denudation by the New Red Sea, or deposition of the Trias series, this is grandly shown in the deep valleys of Bridgewater, Stogumber, Milverton, and Luckham, which are but deep and filled in depressions in the Lower and Middle Devonian series. Section III shows the position of the Exmoor and Quantock Hills, with the Stogumber and Bridgewater valleys; the latter may contain a greater series of Secondary Strata than the Stogumber valley, and may be deeper, and well expresses the probable island like condition of the Exmoor and Quantock Hills at the time of the deposition of the New Red and Lias series. We have no proof that the Lias ever covered these elevated ranges; although the upper Lias of Dundry Hill, near Bristol, and Glastonbury Tor is 600 feet above the level of the Severn, and patches of Lias lie high upon the flanks of the Mendip Hills. The amount of denudation these ranges must have undergone is testified by the great spread of the Breccia and Conglomerate that occupy the valleys mentioned east of Wiviliscombe, from Thorn St. Margaret, to Milverton and Fitzhead. An immense area is occupied by the so called Dolomitic Conglomerate and Breccia, and those who have not visited the valley, and especially Tipnoller Quarry, north-east of Wiviliscombe can form no conception of the magnitude of the destruction, by denudation, of the Devonian Rocks comprising the Exmoor Forest Range, and the Quantock Hills, especially so, when acquainted with the mode of occurrence and spread of the waste over the valleys; *these beds* are frequently worked for lime, when they contain pebbles from the bands of Devonian Limestone, which strike along the east flanks of the Exmoor and Quantock Hills, this is especially the case from Williton to Stogumber, Lydeard St. Lawrence, Fitzhead, Tipnoller, Milverton and Rumington. Amidst and flanking the Devonian series forming the valley from Porlock, by Holnicote, Luckham and Timberscombe, these Magnesio-calcareous Conglomerates are also worked for Lime. Two patches occur at Well-farm and Knoll, which significantly determine the relation of these conglomerates and Red Sandstone Rocks to the older Devonians on which they rest, and to the Rhætic and Lias above. It may be interesting if not important to mention the heights of some of the hills composed of Devonian rocks within the area under notice; three of the most elevated being on the Quantock Hills, namely, Wills Neck 1270 feet, Danesborough (Doncebury) 1022 feet, and Cothelstone Beacon 1062 feet, Grabbist Hill west of Dunster 906 feet, and North Hill north-east of Porlock 824 feet. Lucott and Porlock Hills with Dunkery Beacon suffice to attest the original magnitude of the West Somerset Lower and Middle Devonian strata.

The relation of the Bunter and Keuper Sandstones and Marls, with the succeeding Rhætic and Lias to the underlying Devonian may be thus shown—

Expressed in columnar form or in time they will therefore read:

LIAS	Lower Lias
NEW RED SERIES	Rhætic Series. New Red Marls New Red Sandstone Conglomerate Bunter Sandstone
DEVONIAN	Middle Devonian Lower Devonian

Faults. Between Blue Anchor and Benhole Farm, east of Little Stoke, no less than 16 north and south faults are observable on the shore, and 21 bearing east and west; these so interlace each other at Little Stoke and Kilve as to render it impossible to construct consecutive vertical sections, the continuity being destroyed. The valley of Stogumber lies, I doubt not, in a line of faulted depression with the west flank of the Quantocks faulted up all along its strike. This fine valley is deeply paved with the Dolomitic (Tipnoller) conglomerate, which here and there is seen to occur in patches through subsequent denudation (to be hereafter noticed). The deep Porlock and Luckham Valley ending at Diddon is probably synclinalled and faulted. At Diddon the beds of Grabbist Hill dip north-east, at Timberscombe, half a mile across the valley, they dip south-west continuously, thus showing that this deep and narrow valley, with the parallel one of Minehead and Bratton, divided by Grabbist Hill, 906 feet high, are in much disturbed ground, the distorted or disturbed conditions of which are hidden by the newer overlying and flanking New Red Sandstone, with its conglomerate and patch of Rhætic. They were gulphs or fiords in the New Red period, whose tidal action had power sufficient to lay down the conglomerate in considerable thickness throughout what are now narrow valleys.

One of the finest examples of parallel faults and their effects is shewn west of Watchett, see section VI. Looking due east, near Little Silver, the Planorbis shales, Ostrea beds, White Lias, Black shales of the Upper Rhætic and the Tea-Green passage shales are wedged in between two masses (one in reality) of New Red Marls, the northern wedge-shaped mass has, seaward of it, a repetition of those beds to the south; the sea having destroyed the Rhætic series above its level—Watchett standing between these two parallel faults.

At the Warren, more westward, two equally remarkable north and south faults occur, disturbing a large mass of the cliffs and affording clear evidence of their original and present position, Sec. 5.

The two faults in section V. describe a V shaped area between their inner sides, where the Rhætic series are wedged in; on the west the upper members are denuded. It is a great exhibition of force, and cause and effect; such indeed is the whole cliff; a ground plan of the Watchett coast, and foreshore would appear impossible upon paper.

The grand cliff sections east of Quantocks Head [where they are both anticlinaled and faulted,] exhibit all the Bucklandi and

Lima series up to Kilve Pill, and must be seen to be understood; beyond this about fifteen faults cut up the coast, and expose the Rhætic series again in a remarkable manner, these being the Little Stoke beds noticed at page 3 in slips.

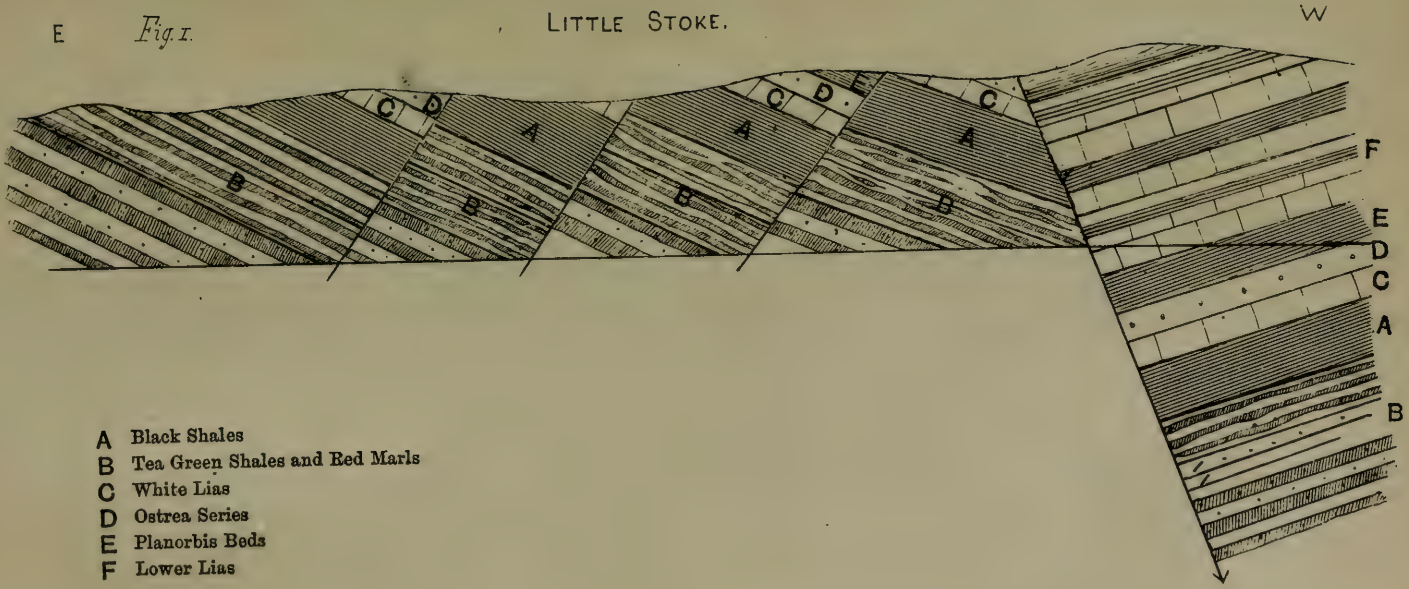
The fore-shore between Quantocks Head and Kilve Pill exhibits a series of horizontal wavy curves and contortions not to be disentangled, this arises from the occurrence of no less than eight east and west faults, parallel to each other, the whole of which, I doubt not influence Watchett, Carhampton, and Dunster to the west, thence dividing into two main branches or take the direction of Minehead and Selworth south of North Hill thus letting in the patch of Rhætic shales, &c. at Venniford and Brandy Street, near Holincote. The other line of faulting passes under the southern slopes of the bold and massive Grabbist Hill, and along the romantic valley of Avil and Timberscombe, to Wooton Courtney and Luckham and on to the submerged Forest of Porlock. Patches of Dolomitic conglomerate at Porlock, Knoll, Luckham, and Timberscombe, evidence the amount of denudation and subsequent removal of superincumbent strata that has since taken place.

The table of comparative sections of the West Somerset Rhætic is constructed to show the relative thickness of the various subdivisions, both above and below the horizon of the Bone Bed in four different localities, these are compared with a known standard of succession shown on the right hand column, and which is really complete on both sides of the channel, viz. at Dunraven and Penarth on the opposite Welsh coast, and at St. Audrey's slip. It has reference chiefly to the Black Shales, but is not critically correct.

	RHÆTIC					LOWER LIAS			
	E. of Harbour	W. of Harbour	Railway	St. Audrey's	Little Stoke	Ostrea Beds	Planorbis Beds	Angulatus Beds	Bucklandi Beds
Avicula contorta	*	*	*	*					
,, solitaria	*								
Lima precursor	*			*	*				
Modiola minima	*	*		*	*	*			
Placunopsis alpina	*			*					
Ostræa intusstriata				*	*	*?			
Gervillia precursor		*	*	*					
Pecten Valoniensis	*	*	*	*	*				
,, Rhæticus		*							
Pteromya Crowcombeia	*			?					
Trigonia (Myophoria) postera	*	*	*	*					
Cypricardia Suevica	*			*					
Cardium Rhæticum	*	*	*	*	*				
Pullastra arenicola	*	*		*					
Myacites striata-granulata		*		*					
Myophoria Postera	*			*					
Pleurophorus elongatus	*	*	*	*					
,, angulatus	*								
Anatina præcursor		*		*					
,, Suessii	*		*	*					
,, elongata	*	*		*					
Axinus depressus	*			*					
,, elongatus	*	*		?					
,, Cloacinus	*	*			*				
Cylindrites elongatus	*	*							
Chemnitzia Henrici	*	*							
,, nitida	*								
Anneidian tracks	*		*	*					
Acrodus striatus	*								
,, acutus	*			?					
Saurichthys apicalis	*	*	*	*					
,, acuminatus	*			*	*				
Sargodon tomicus	*	*		*					
Gyrolepis tenuistriatus	*	*		*					
,, Alberti	*	*	*	*					
Hybodus pyramidalis		*		*					
,, pliactilis	*								
Pterodactylus	*	*							
Microlestes (Hypsiprimnopsis) Rhæticus		*							
Pecten textorius								*	
Lima Hermannil								*	*
,, pectinoides								*	*
,, antiquata						?	*	*	*
Ostrea liassica						*			
,, irregularis								*	*
,, arietis								*	*
Plicatula spinosa						?		*	
Pholadomya ambigua	?							*	*
,, prima						*			
Myacites unionides						*			
Carpanteria Heberti						*			
Pecten Pollux						*			
Gryphæa arcuata								*	
Lima nodulosa						*			
Gryphæa incurva									*
Pinna folium									*
Extracrinus Briareus									*
Ammo. Bucklandi									*
,, Conybeari									*
,, angulatus								*	*
,, planorbis							*		

Fig. I.

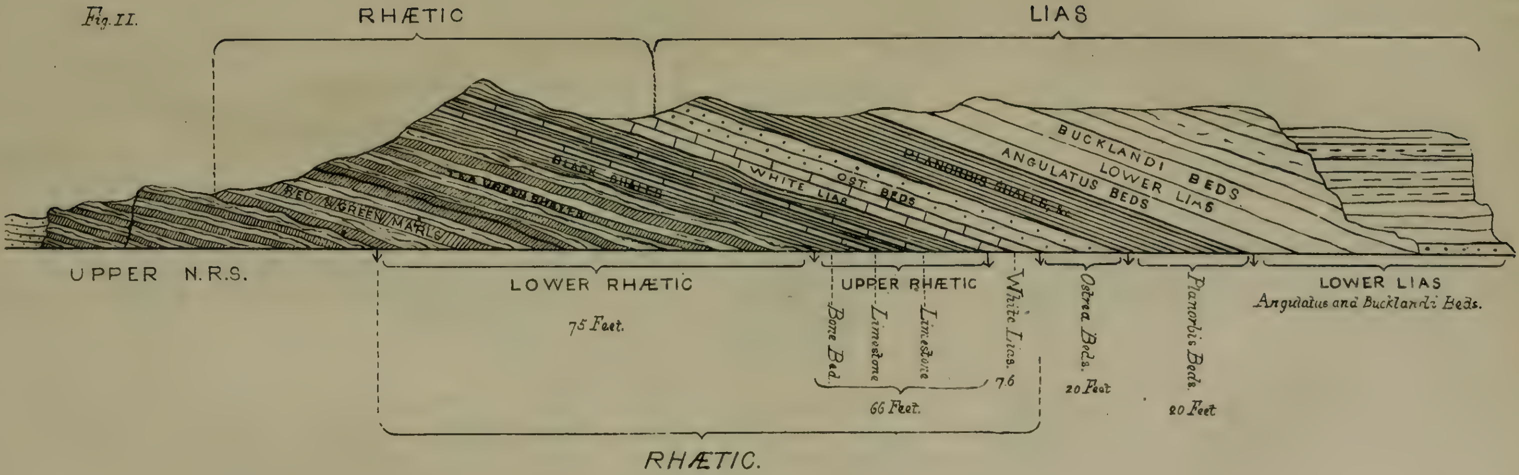
LITTLE STOKE.



A	Black Shales
B	Tea Green Shales and Red Marls
C	White Lias
D	Ostrea Series
E	Planorbis Beds
F	Lower Lias

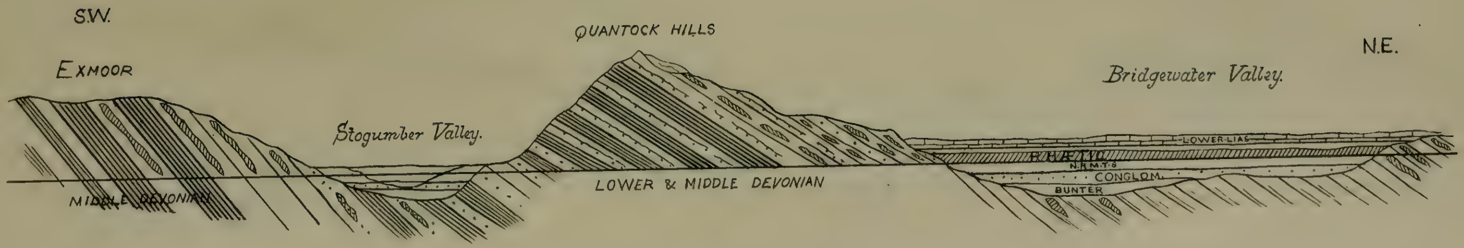
A

Fig. II.


RHÆTIC
LIAS
BUCKLANDI BEDS
LOWER LIAS
ANGULATUS BEDS
PLANORBIS SHALES, &c.
OST. BEDS
WHITE LIAS
BLACK SHALES
TEA GREEN SHALES
RED & GREEN MARLS
UPPER N.R.S.
LOWER RHÆTIC
75 Feet.
UPPER RHÆTIC
Bone Bed.
Limestone
Limestone
66 Feet.
White Lias.
7.6
Ostrea Beds.
20 Feet
Planorbis Beds.
20 Feet
LOWER LIAS
Angulatus and Bucklandi Beds.
RHÆTIC.

BRITISH MUSEUM

Fig. III.


S.W.
Exmoor
Stogumber Valley.
QUANTOCK HILLS
N.E.
Bridgewater Valley.
LOWER LIAS
RHAETIC
N.R.M.T.S
CONGLOM.
BUNTER
LOWER & MIDDLE DEVONIAN
MIDDLE DEVONIAN

NATURAL HISTORY

Fig. IV.

WEST OF WATCHETT.

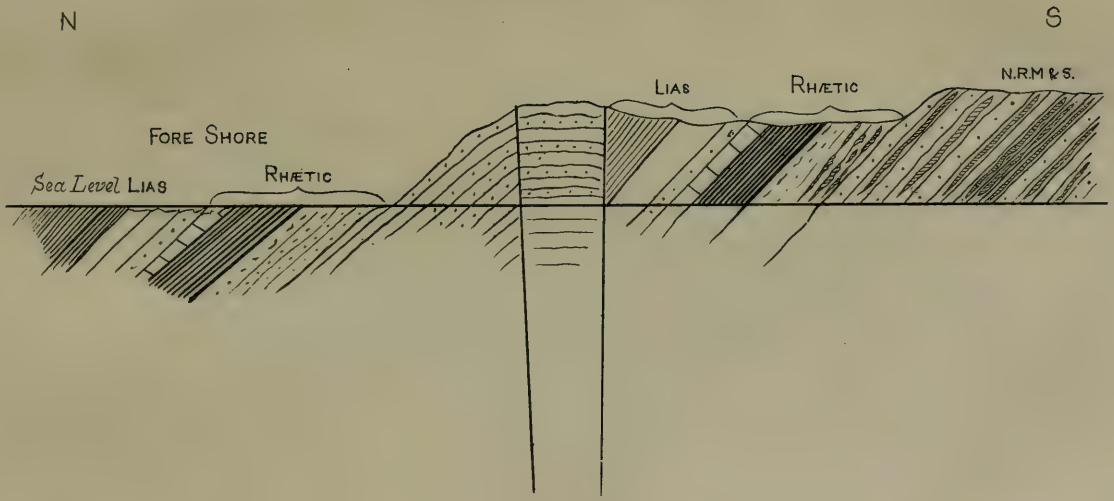


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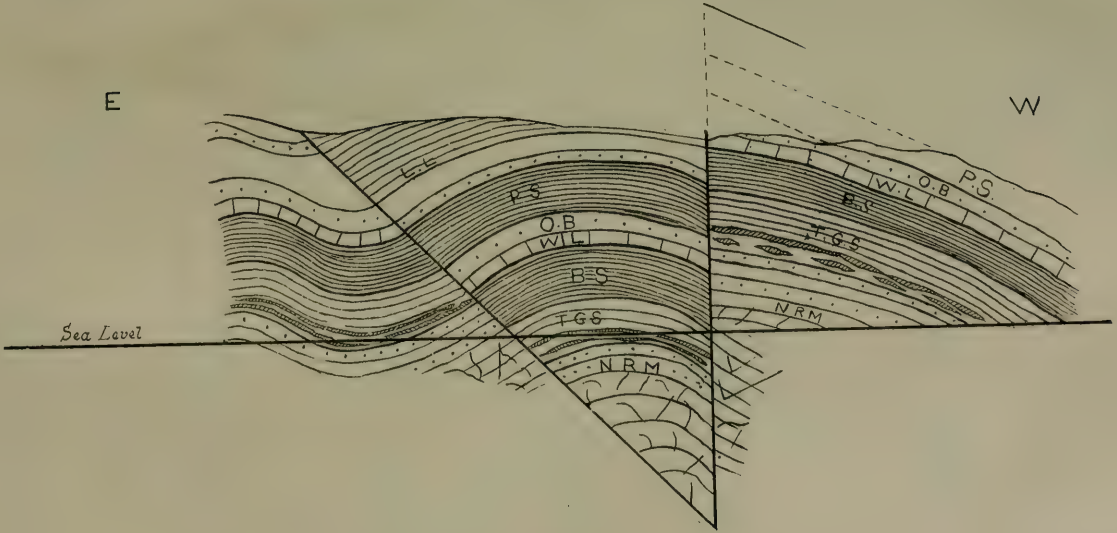
Fig. V.

WARREN FAULT, WEST OF WATCHETT.



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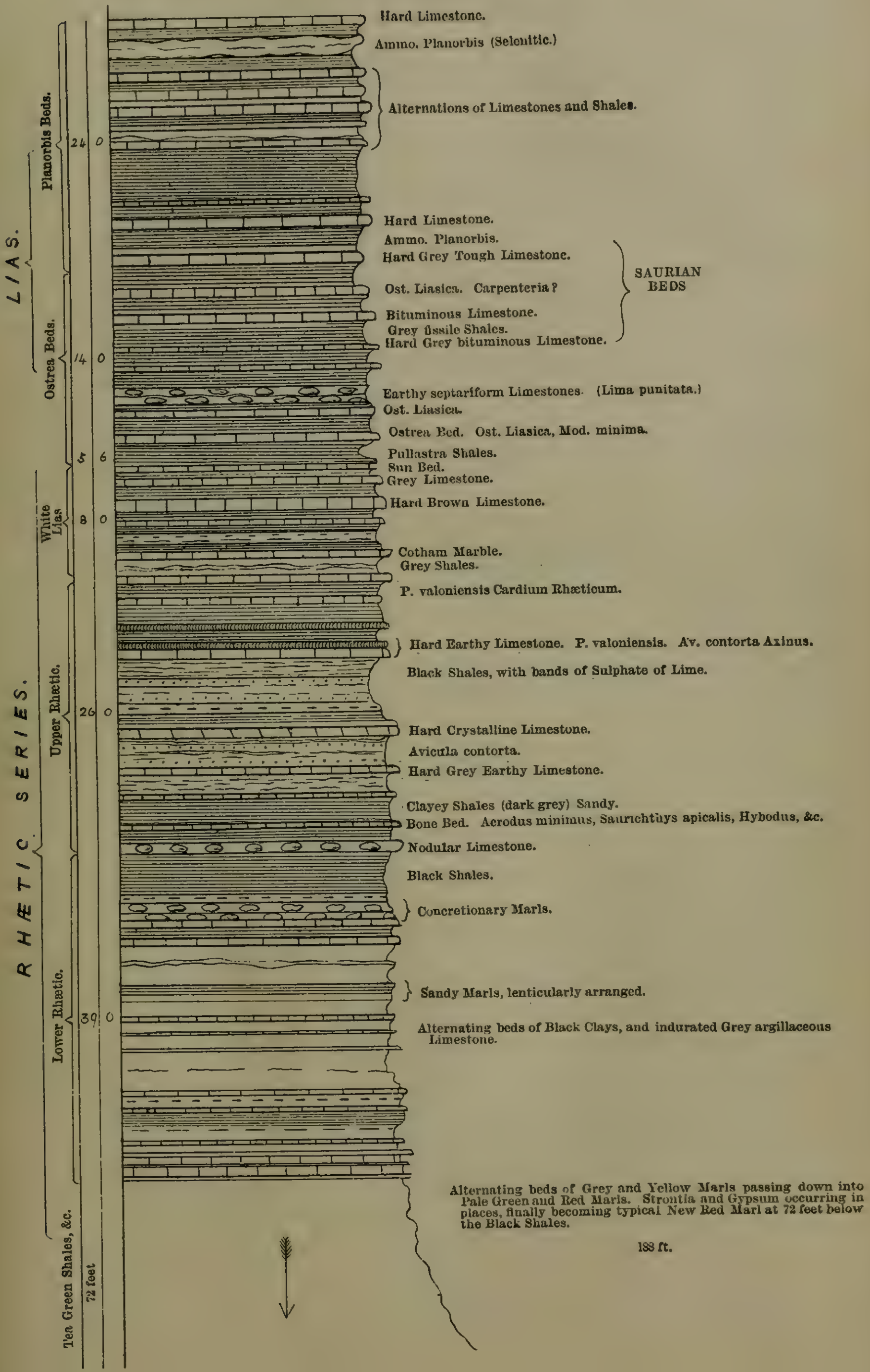
No. VI.

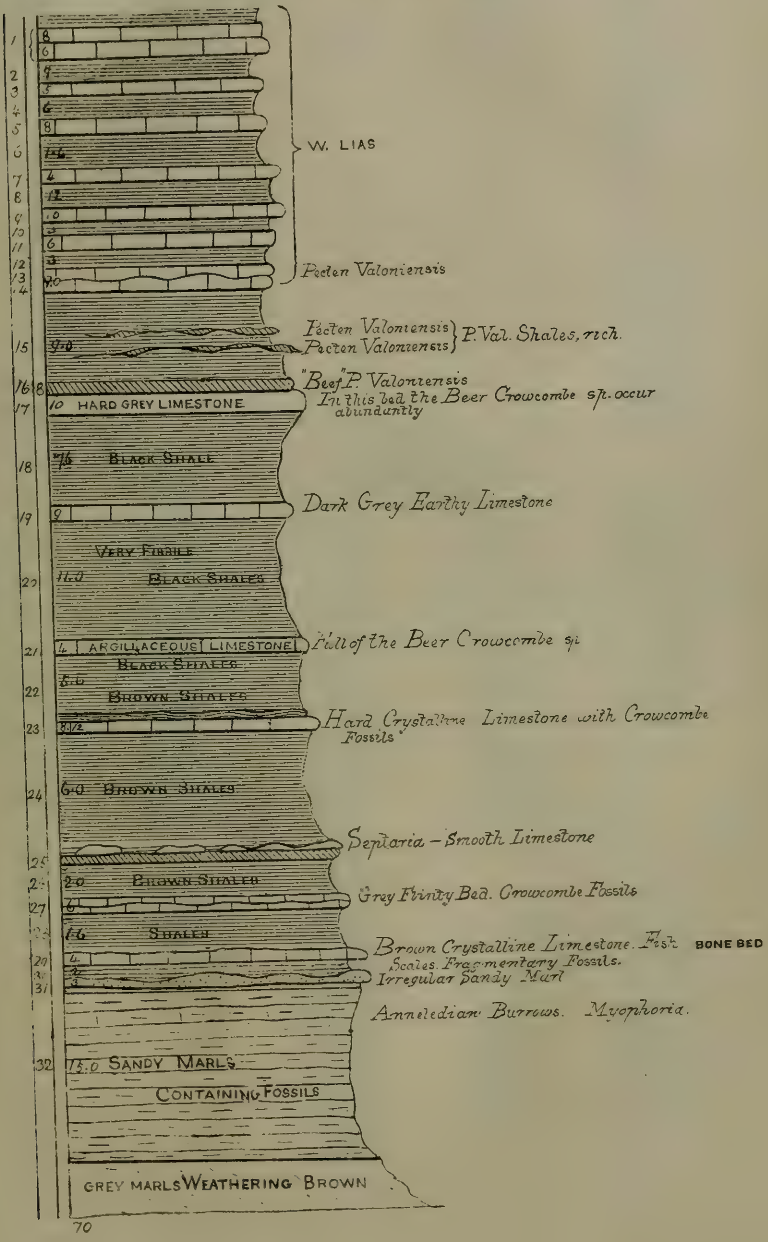
SECTION OF THE RHÆTIC, OSTREA & PLANORBIS BEDS AT ST. AUDREY'S SLIP EAST OF WATCHETT.


LIAS.
Planorbis Beds.
24 0
Ostrea Beds.
14 0
5 6
White Lias
8 0
RHÆTIC SERIES.
Upper Rhætic.
26 0
Lower Rhætic.
39 0
Tea Green Shales, &c.
72 feet
Hard Limestone.
Ammo. Planorbis (Selenitic.)
Alternations of Limestones and Shales.
Hard Limestone.
Ammo. Planorbis.
Hard Grey Tough Limestone.
Ost. Liasica. Carpenteria?
Bituminous Limestone.
Grey fissile Shales.
Hard Grey bituminous Limestone.
SAURIAN BEDS
Earthy septariform Limestones. (Lima punitata.)
Ost. Liasica.
Ostrea Bed. Ost. Liasica, Mod. minima.
Pullastra Shales.
Sun Bed.
Grey Limestone.
Hard Brown Limestone.
Cotham Marble.
Grey Shales.
P. valoniensis Cardium Rhæticum.
Hard Earthy Limestone. P. valoniensis. Av. contorta Axinus.
Black Shales, with bands of Sulphate of Lime.
Hard Crystalline Limestone.
Avicula contorta.
Hard Grey Earthy Limestone.
Clayey Shales (dark grey) Sandy.
Bone Bed. Acrodus minimus, Saurichthys apicalis, Hybodus, &c.
Nodular Limestone.
Black Shales.
Concretionary Marls.
Sandy Marls, lenticularly arranged.
Alternating beds of Black Clays, and indurated Grey argillaceous Limestone.
Alternating beds of Grey and Yellow Marls passing down into Pale Green and Red Marls. Strontia and Gypsum occurring in places, finally becoming typical New Red Marl at 72 feet below the Black Shales.
188 ft.

BRITISH MUSEUM

VII.

RAILWAY SECTION SOUTH OF WATCHETT HARBOUR



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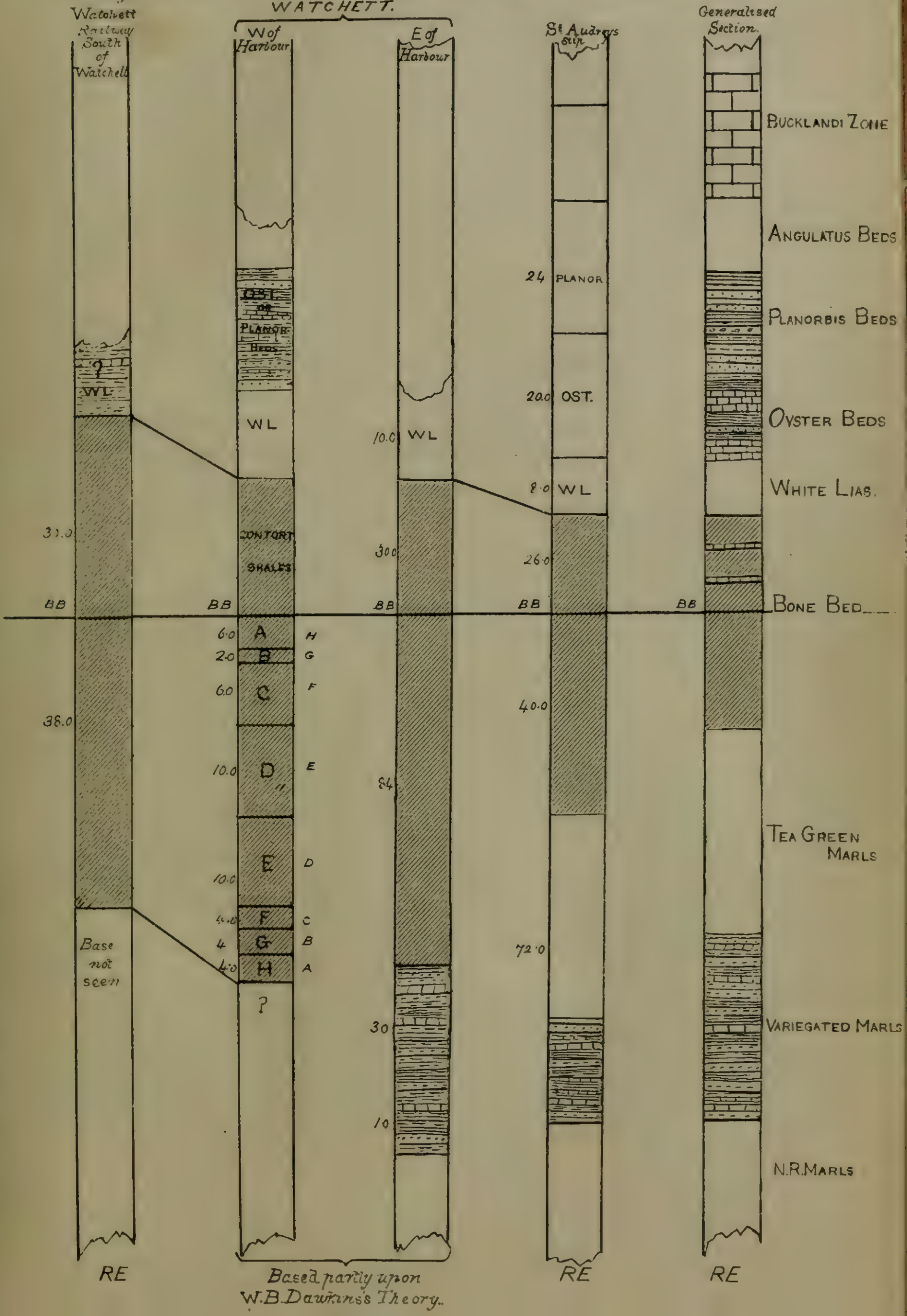
COMPARATIVE SECTIONS OF THE WEST SOMERSET RHÆTIC SERIES,

Taking the Bone Bed as a Special Horizon for Comparison.



BRITISH MUSEUM NATURAL

A Sketch of the History of Berkeley. Read at a Meeting of the Cotteswold Club, on the 26*th July,* 1871, *at Berkeley, by* J. H. Cooke.

At the earliest period of which we have any authentic information, that of the second Roman invasion, the Vale of Berkeley was for the most part a thickly wooded tract extending from the Bristol Avon northwards as far as or beyond Berkeley. The lower lands near the Severn were frequently overflowed by the tides, and must have been a morass; the woods of the higher and dryer regions afforded acorns and other food for the herds of swine kept by the inhabitants, while the more open parts furnished pasturage for their cattle. A specimen of the general aspect of the country at this time may still be seen in Michaelwood, Hill Woods, and the Lower Woods near Hawkesbury, which are no doubt remnants of the primeval forest which in early ages covered the vale district of Gloucestershire.

The inhabitants of this region were a British tribe called the Dobuni; a name derived from an ancient British word signifying a valley or low place, their dwellings being for the most part in the valleys of the district. They were a race of a more quiet and peaceable disposition than many other of the native tribes, and were consequently much harassed by the incursions of their more warlike neighbours, the Cattieuchlani on their Eastern frontier, and the Silures who inhabited the country on the Western side of the Severn.

The Romans who under Aulus Plautius, a General of the Emperor Claudius, first penetrated into these parts about A.D. 45, soon overcame and then made a treaty with the Dobuni, by which in return for their submission Aulus Plautius undertook to protect them from their troublesome neighbours. The more effectually to do this he planted garrisons among them, and subsequently Ostorius Scapula, a general who succeeded Plautius, built a chain of fortified posts or camps from the Avon to the Severn, which have been supposed to be those at Old Sodbury, Uley-bury, Painswick, Bredon Hill, and some others, the remains of which are still visible along the brow of the Cotswold Hills, overlooking the Vale.

The Dobuni being thus favourably disposed to and allied with the Romans, the latter rapidly settled in and colonised the province. That the Romans had a station or settlement of some kind at Berkeley I think there can be no doubt; most probably a fortified camp or military post, to secure the passage across the Severn to Aylburton, near Lydney, where they had an important settlement. Round this the natives would naturally gather, and thus a town would in time be formed. Coins, tiles or bricks, sculptured stones, and other relics of Roman occupation have been found; the form of the town, four streets meeting in the centre or Forum, is adduced by Fosbroke in support of its Roman origin; a Roman road called Ridgeway, which Fosbroke supposes to have run in this direction, but which he failed to find, exactly corresponds in the description of it, which he quotes from the register of St. Augustine's Abbey, with the road from the Ridge near Symondshall to Dursley; this road again is a continuation in nearly a straight line of the Acman Street, which Fosbroke says Mr. Leman paced from Cirencester towards the Severn as far as Symondshall; continued in a straight line across Stinchcombe Hill, this road passes through Berkeley to the Severn opposite to Lydney.

I hope I may not be thought too visionary if I venture to suggest that the Roman Station Abone, about which there has been so much controversy and conjecture, may, not improbably, be placed at Berkeley. The town stands on the Avon, of which the name Abone is supposed to be the Latinised form, and the distances in the Itinerary suit Berkeley at all events as well as they do most of the other places in the county which have been supposed to be the site of Abone.

After the withdrawal of the Romans a long period of anarchy and bloodshed followed, during which the Island was overrun by the Saxons and the Danes, who settled in and occupied the country, driving the original inhabitants into the more inaccessible parts of Wales, Devon, and Cornwall.

In the reign of EDWARD the Confessor we find the earliest mention of Berkeley, in the celebrated legend of the "Witch of Berkeley," on which SOUTHEY has written a well-known ballad. At that time the site of the castle was occupied by a wealthy nunnery, which was endowed with the greater part, if not the whole, of the manors now forming the Hundred or Great Manor of Berkeley.

About the year 1043 the celebrated Earl GODWIN, having cast a covetous eye on the rich possessions of the Nunnery, contrived its suppression by an artifice which is recorded in the County Histories, and then procured from the king a grant of its confiscated estates to himself. He did not, however, long enjoy his illgotten wealth; a few years afterwards he fell into disgrace and fled to the Continent, and the whole of his possessions was confiscated; he returned, however, in the next year, and regained, to some extent, his power and influence, but died within the year A.D. 1053.

Berkeley seems to have been retained by the king, EDWARD the Confessor, and was by him granted at a fee-farm rent equal to £500 17s. 2d. of modern money to ROGER the Lord of DURSLEY, who was of an old Saxon family said to be allied in blood to the king. At the Conquest ROGER was permitted by the Norman king to continue to hold Berkeley as before, and it remained in the possession of his son and grandson down to the latter end of the reign of STEPHEN. From their tenure of the royal manor of Berkeley, by far the greater part of their possessions, this family assumed or were known by the name of DE BERKELEY, which continued to be their patronymic for many generations, until the male line became extinct in 1382. It is necessary to distinguish between these DE BERKELEYS and the descendants of ROBERT the son of HARDING the Dane, who afterwards assumed the same name, but who did not possess BERKELEY till the beginning of the reign of HENRY II.

During the contentions for the crown between STEPHEN and the Empress MAUD and her son, afterwards HENRY II., ROGER DE BERKELEY, the grandson, LORD OF DURSLEY, as a crown vassal of course supported his sovereign; but on the accession of HENRY he was punished for his fidelity by being deprived of Berkeley, which the king bestowed upon ROBERT, the son of HARDING, who had been one of the principal adherents of the Empress, his mother.

This ROBERT was the founder and direct ancestor of the present noble family of Berkeley, and the manor has continued in the possession of his descendants (with the exception of one short alienation) down to the present time. His father, HARDING, was a Dane of royal descent, who had come over in the train of WILLIAM the Conqueror, and was by him rewarded with large possessions in and around Bristol, where he resided. By the same deed by which HENRY granted to ROBERT the Great Manor of Berkeley, (and which is still preserved at the castle,) he covenants to build for ROBERT a castle there, and to see this engagement performed the king came to Berkeley in 1154, and the building was then actually commenced.

Mr. SMYTH states that the castle was built out of the ruins of the nunnery formerly mentioned. It also appears that some kind of religious foundation had continued on the spot down to that time, as in the great Roll of the Pipe of the last year of the reign of STEPHEN, there is an entry of an allowance for the garments of three nuns resident at Berkeley. I therefore conceive that no castle existed at Berkeley prior to this time, and that the "Castle of Berkeley" mentioned by ATKYNS and RUDDER, from which ROGER the lord thereof was ejected for his adherence to King STEPHEN, must be considered to refer to the castle at Dursley, the old family inheritance of ROGER.

The castle at its first erection consisted of the keep only and the buildings within it, the remainder being the work of the three succeeding lords, and was only completed during the reign of EDWARD III.

The History of Berkeley and its Lords is henceforth the History of England; there being scarcely a transaction in the civil or military annals of the kingdom in which they were not mixed up.

Robert de Berkeley was one of the barons who won Magna Charta from king John. His immediate successors were actively engaged in the Welsh wars, which ended in the conquest of that country, in the wars against the Scots under Wallace and Bruce, and they fought at Crecy, Poictiers, and Agincourt. They were generally to be found on the popular side in all rebellions; that against the favourites of Edward II. found its successful close in the imprisonment and murder of the king at Berkeley Castle, on September 21st, 1327. The combination between Henry of Lancaster (afterwards Henry IV.,) and the Duke of York, which led to the downfall of Richard II., took place at the castle and in the church of Berkeley in 1399. Thomas, 10th Lord Berkeley, in the time of Henry IV., A.D. 1404, commanded an English fleet which gained two important victories over the French, who were endeavouring to support Owen Glendower's rebellion in Wales. The Berkeleys took no prominent part in the Wars of the Roses, being then engrossed with the family contests between the heirs male and the heirs general of Thomas, the 10th Lord, in the course of which the castle was several times besieged, taken, and retaken, and the battle of Nibley Green was fought between William, 12th Lord Berkeley, and his cousin Lord Lisle, in 1469. William, Lord Berkeley became successively Earl of Nottingham, Marquis of Berkeley, and Great Mareschal of England, and, dying in 1492, left the castle and the whole of the family inheritance by his will to the king, Henry VII. It was held by that king and his successors, Henry VIII. and Edward VI., until by the death of the latter, without issue, in 1553, it again returned to the family, after an alienation of sixty-one years, four months, and twenty days. Henry, 17th Lord Berkeley, and his Lady were remarkable for their magnificence at the coronation of Queen Elizabeth. During the Civil Wars of Charles I. reign, the castle was at first occupied by the Parliament, but the garrison was withdrawn to reinforce that of Gloucester, after which it was held by the royal forces. In 1645 the Parliamentary troops besieged the castle, and, after taking the town and church by storm, the castle was surrendered upon honourable terms on the 26th September. It was afterwards given back to George Lord Berkeley, and to render it thereafter incapable of defence the large gap or breach was made, which is seen on the north-west side of the keep. Since that time it has remained in the possession of the family, devoted, happily, to more peaceful purposes. Long may it remain so!

The Chapels.

"To the end that the two chapels, the one of our Lady "and the other of St. John the Baptist, founded in the castle "of Berkeley, (the one in the keep over the great well, the "other at the upper end of the great hall stairs,) might be "renewed and frequented with due honours, Maurice, 9th Lord "Berkeley, on the 25th May, 1364, procured of Pope Urban II. "forty days' pardon and release of the penance enjoyned to "every one that should, in the said chapels, on the festival days "of the year, hear Masses, or say, kneeling, three Ave Mary's, "or should give any vestments, ornaments, gold, silver, books, "chalices, or any other aids of charity to the said chapels; and "whosoever shall there pray for the obtainer of these presents, "and for the life and good estate of the noble Lord Maurice "de Berkeley, and of the noble Lady Elizabeth, his wife, and "of their children (the obtainers hereof), and for the soul of the "Lord Thomas, his father, being in purgatory, shall be also "released of forty days of the penance enjoined them."

This bull for greater infallibility is also under the seals of eleven cardinals, there being at that time three rival popes in the church.

John Trevisa.

In the time of Thomas the 8th, Maurice the 9th, and Thomas the 10th Lords Berkeley, 1340 to 1412, lived John Trevisa, a gentleman of an antient family, bearing *Gules a Garbe Or*, borne at Crocadon, in the parish of St. Mellion, near Callington, in Cornwall, a secular priest and vicar of Berkeley, who translated the Bible, the Polichronicon of RALPH HIGEDEN, *alias* RAYNULPH, Monk of Chester, Bartholomew of the Proprieties of Things, and divers other treatises, all into English, dedicating the two first to THOMAS, the 8th LORD, and the rest to his son and grandson.

In a Dialogue, (wherein he makes this lord and himself the speakers,) in his Polichronicon, he argueth the profit arising by histories, and the necessity of translations into the English tongue; in urging whereof he bringeth in this Lord THOMAS instancing his own chapel in Berkeley castle, wherein the Apocalypse, saith he, is written on the walls and roof in Latin and French; some traces of which are still visible in the arched passage near the windows, and on the timbers of the roof.

But BALE delivers the learned labours of this TREVISA more largely, thus.—"JOHN TREVISA, a gentleman of Cornwall, was a "priest, and vicar of Berkeley, a man famous for learning and "eloquence, who especially above others laboured to adorn the "English tongue, and to remove the old harshness thereof, "whereby he became very dear unto many of the nobles of the "land, but especially to his excellent Lord, THOMAS of Berkeley; "and amongst other studies which much delight the mind of men, "histories and antiquities best pleased him, as from whence "the best councils and examples of life might be drawn; wherein, "whilst he studiously laboured, he sometimes shewed himself "harsh and biting towards monks and their profession, taxing "their pride, riot, and hypocrisy; as where he saith,—'We "read that Christ instituted Apostles and Priests, but never "ordained monks and begging friars;' with many other the "like taunts. Into the English tongue, he likewise, at the "request of his said Lord BERKELEY, saith BALE, translated "the whole Bible, as well as the Old as New Testament, and "many other works, 'which BALE there rehearseth particular, "and continued his Polichronicon,' saith BALE, 'unto the year "of Christ, 1397, being the 21st of King Richard II, till when "and somewhat after himself flourished." He died in 1412, and was buried in Berkeley Church.

Trevisa was a cotemporary of Wycliff whom he much resembled in the enlightenment of his doctrines and in his denunciations of the monastic system, especially of the Mendicant Orders. As Wycliff held the Prebend of Aust in the Collegiate Church of Westbury-on-Trim in this county it seems not too much to suppose that Trevisa and his Lord may have imbibed some of the reformed doctrines which they appear to have held, by personal intercourse with Wycliff.

Though neither Trevisa nor his Patrons are usually ranked amongst the followers of Wycliff, or the Lollards, "yet," says Milner, "do they seem to be sufficiently distinguished by their piety and veneration for the scriptures."

The Murder of Edward the 2nd.

In 1322, Maurice 7th Lord Berkeley, engaging with the Lords Audeley and Mortimer in the rebellion directed against the Kings favourites, the Despencers, was seized by the King (Edward II.) at Cirencester, where he had been induced with others to come on the faith of a safe conduct, and committed to prison in the Castle of Wallingford, where he died 5 years after. Thomas, his son, who succeeded him, continued the rebellion, and ravaged the manors belonging to the favourites in Oxon and Berkshire, but was taken prisoner and committed to the Tower, whence he escaped. He was, however, again captured and sent to the Castle of Pevensey, and remained a prisoner nearly five years, until he was set free by the success of the Queen's party in 1326. During the last six years of the reign of Edward II. it is recorded that half the baronage of England were butchered, imprisoned, or banished by the King in the course of the struggles against the King's favourites.

The popular party was, however, at length reinforced by the Queen Isabella and the Prince of Wales, and a new and stronger combination was formed, by which Edward ultimately lost his crown and his life. The DESPENCERS were soon taken and executed as traitors, and the King himself being deserted by his friends, was soon after captured in South Wales. He was first sent to Kenilworth Castle, THOMAS, Lord BERKELEY, Sir JOHN MALTRAVERS and Sir THOMAS DE GOURNAY being charged with his safe custody. GOURNAY and MALTRAVERS, who were his immediate gaolers removed him to Corfe Castle, and thence to Bristol, from whence he was brought on Palm Sunday April 5th, 1327 to Berkeley Castle. Lord BERKELEY courteously received the King, and seems to have treated him with kindness and consideration; but this did not please the Queen and her advisers, for letters were soon after sent to Lord BERKELEY commanding him to "use no familiarity with EDWARD the late King," but to deliver over the custody of him to MALTRAVERS and GOURNAY. Perceiving what was intended, Lord BERKELEY withdrew with a heavy heart to his manor house at Wotton-under-Edge. GOURNAY and MALTRAVERS now treated their unhappy charge with the greatest cruelty and indignity, hoping thereby to hasten his death; and among other tortures they almost suffocated him with the stench of putrid carcases placed in a cellar or dungeon under the floor of his apartment. As this treatment did not sufficiently hasten his death, they at length murdered him with circumstances of horrible barbarity at midnight on 21st September, 1327. His shrieks were heard in the town, and in the morning the inhabitants were told that the King had died of some sudden seizure in the night, and were invited to come and view the body. It shewed no wound, but the features were terribly distorted as though from a violent and painful death.

The monasteries at Kingswood, Bristol, and Malmesbury refused to receive the corpse, fearing the Queen's displeasure, but the Abbot of St. Peter's at Gloucester, to his honour, brought it from Berkeley and received it at his Cathedral, with a procession of the whole convent and of the city, and buried it honourably in the north aisle, near the high altar.

The Steward's accounts of the time contain several entries having reference to the King's residence at Berkeley, and the tragedy of his death. Two sums of £700 and £500 were received from the exchequer for the maintenance of the King and his attendants during the period of his imprisonment. There is an entry of 31*s.* 1*d.* for the expenses of THOMAS DE GOURNAY going to Nottingham to inform the Queen of EDWARD's death. The REEVES' accounts of the manors of Ham and Alkington shew what provisions they sent in to the castle for the royal maintenance from Palm Sunday to 21st September that year, (1327). There are entries of moneys paid for dyeing canvas black to cover the carriage on which the corpse was conveyed to Gloucester for interment in the Cathedral; of 37*s.* 8*d.* for a silver vessel to place the King's heart in; of 21*d.* paid in oblations at several times in the castle chapel for the repose of his soul; of 18*s.* 9*d.* for the expenses of some of Lord BERKELEY's family going with the body to Gloucester.

The Queen's party, on whom the guilt really rested, endeavoured to get rid of the responsibility by charging the murder on Lord BERKELEY, and he underwent a trial by a jury of twelve knights, who acquitted him of the charge except as regards some negligence, and he was liberated on bail. The charge was, however, kept hanging over him, probably to divert attention from the really guilty parties, until 1338, when he was finally and fully acquitted.

BERKELEY CHURCH.

The Parish Church of St. Mary, Berkeley, is one of the finest in the county, and may in many respects challenge comparison with some of our noblest ecclesiastical edifices.

The splendid west front with its beautiful five-light window and elaborate doorway, the lofty and spacious nave, and the clustered pillars and graceful arches of its arcades are scarcely equalled by many of our cathedrals. The other parts of the church are, however, scarcely worthy of so grand a centre.

The aisles are comparatively poor, and their western terminations contrast most unfavourably with that of the magnificent nave; the absence of a tower and the flatness of the roofs, are serious defects in its external appearance; the south side, however, with its ancient doorway and circular window, its clerestory, and the beautiful sepulchral chapel of the BERKELEY family, are well worthy of a study.

No positive records exist of the erection of the church, but it is supposed by FOSBROKE to have been founded by ROBERT FITZHARDINGE during the building of the castle. An older church, attached to a tower of which the present one is a modern reproduction, formerly stood on the other side of the churchyard, but it is not known whether it was the prebendal church which existed here down to the latter end of the twelfth century, or some remnant of the nunnery which was suppressed in the reign of EDWARD the Confessor.

If, however, FITZHARDINGE built a church it must have been gradually rebuilt at subsequent periods, as nothing now remains which is clearly of his era except the south doorway and the font. There are, however, some appearances of work of a still more ancient date, which countenance the supposition that FITZHARDINGE partly rebuilt a previously existing Saxon church, and that his church was again altered and rebuilt by his successors during the 13th and 14th centuries. The arcades and the west window and doorway were probably the work of THOMAS, the 6th Lord, during the reign of EDWARD I. The chancel was next enlarged and the south aisle rebuilt probably by Lord THOMAS his grandson early in the 14th century, and the re-erection of the north aisle took place at a somewhat later period. These alterations were probably made while the venerable TREVISA was the parish priest.

The perpendicular windows in the chancel and the rood screen of the same style, are of much later date. The latter was probably put in to replace an older one of timber, and perhaps also to counteract some tendency to give way which is still visible in the chancel arch.

The paintings on the walls of the church are most valuable and interesting examples of ancient decorative art.

They are exact reproductions of the original decorations of the 13th century, remains of which were found in all parts of the church when the repeated coats of whitewash and plaster were removed during the restoration in 1865. It is the opinion of competent judges that they form part of the original design of the building, many parts of which appear to have been left purposely bare of architectural ornament, in order that the want might be supplied in this manner. For this purpose they are most effective; the long straight lines of pattern fill up what would otherwise be blank spaces of wall, and enhance the perspective effect, while the richness and warmth of the colouring are most grateful to the eye after the cold whitewash to which the present generation has so long been accustomed. Some remains of a later and inferior style of mural decoration have been left on the wall over the north door. At the east end of the north aisle there are some fragments of an ancient painting of a martyrdom, near which on the splay of a window, was a beautiful figure of a saint or angel now almost faded away. Over the chancel arch appears part of what was probably a "Doom Picture," or representation of the last judgment. On the wall at the east end of the south aisle is a painting of the Tudor rose, surmounted by a crown, on each side of which are the letters E. R. A similar figure was found between each of the windows, of the south aisle. There are also in the south aisle some curious narrow slits or recesses in the wall, between the windows, which occasioned no little speculation when they were discovered during the restoration. It is most probable that they were made to receive the timbers of a former high pitched lean-to roof.

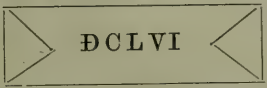
Besides the monuments in the sepulchral chapel, the church contains only two tombs of members of the BERKELEY family, most of whom down to 1463 were buried in St. Augustine's, Bristol. Under an arch on the south side of the chancel, communicating with the sepulchral chapel is a fine altar tomb of alabaster bearing the effigy of JAMES, 11th Lord BERKELEY, who built the chapel, and who died in 1463. By his side, on the same tomb, is a smaller but similar figure representing his second son JAMES, who was slain while serving in the wars in France under the celebrated JOHN TALBOT. Under the second arch between the nave and the south aisle is the tomb of

Thomas, 8th Lord, one of the benefactors to the church already mentioned, who died in 1361, and in whose time the murder of Edward II took place.

The tomb bears his effigy, and also that of the Lady Katherine his second wife, who died in 1385. In the window near are three small recumbent figures in stone, being those of three of their sons who died in their infancy.

It is probable, from the quantities of fragments of stained glass which were found under the floor during the restoration of the church, that all the windows were once filled with stained glass. They were most probably destroyed during the siege of the castle in 1645, when the church, which formed part of the defences of the garrison, was stormed and taken by the Parliamentarians. Some interesting traces of these events are still visible in the west doors, which have been pierced for musketry, and are marked in many places by hostile bullets.

During the restoration of the church some interesting relics proving the Roman occupation of the place were found at a depth of nearly four feet beneath the soil in the chancel. One of these, a Roman brick or tile bearing the inscription



(Decurio Legionis Sexti,)

has been preserved by being imbedded in the plastering of the wall on the south side of the chancel arch, near the lectern. There are also two large flat stones, nearly square, having on one side circular mouldings about two feet in diameter somewhat resembling the bases of columns. These are at present in the sepulchral chapel.

The restoration of the church was carried out in 1865 and 1866, by Mr. Gilbert Scott, in a manner entirely worthy of its fine original design. The expense was borne chiefly by the late Lord Fitzhardinge, whose liberality to the church forms a worthy sequel to that of his ancestors of the 13th and 14th centuries.

Annual Address to the Cotteswold Field Club, read at Gloucester on Thursday, 6th March, 1873, *by the President,* Sir W. V. Guise, Bart., F.L.S., F.G.S.

Gentlemen,—

I have much pleasure in reporting that the condition of the Club continues to be in all respects satisfactory.

There has been delay in the issue of the Transactions for the past season. For that delay I am primarily responsible, having mislaid Mr. Etheridge's paper on the "Physical Structure of the Watchet Area." The paper, when found, had to be returned to the author for additions and corrections; and for the further delay the printer is responsible. The volume is now, however, in the hands of members; and I may be permitted to congratulate them on their possessing in Mr. Etheridge's paper, with its accompanying sections, one of the most valuable contributions to our Transactions which the Club has ever published.

I desire to draw the attention of Cotteswold Geologists to a paper by Dr. Albert Günther, F.R.S., in the *Popular Science Review* of July last, giving an account of a species of "Ceratodus" discovered in the rivers of Queensland. These Ceratodont fish have hitherto only been known to us by a few scattered teeth preserved in the Trias and Lias; and it is most interesting to Geologists to find this Old-World type still preserved in these mud-fishes of Australia—a land which appears, in its Cestracionts, Trigoniæ, and Marsupials, to represent a condition of life which passed away with the Secondary period, to which this newly-discovered Ceratodus is a fresh and striking addition.

THE ANNUAL MEETING OF THE CLUB

was held at the Queen's Hotel, Cheltenham, on Tuesday, 2nd April, 1872, on which occasion you were so kind as to testify your continued confidence in me by again electing me to the honourable office of President. Dr. WRIGHT and Mr. LUCY were again chosen Vice-Presidents, and Dr. PAINE, Hon. Secretary.

The Secretary produced his financial statement, which was received and adopted. He stated that some time since the Bath Naturalists' Club had called the attention of the Cotteswold Club to the dilapidated condition of the Frocester Hill Tumulus, which was rapidly falling into decay, a part of the top having fallen in, and the chambers being quite blocked up with rubbish, so that access to it had become impossible. Application was made on behalf of the Club to Col. KINGSCOTE, the owner of the property, and with his permission, most kindly given, the requisite repairs were undertaken, the covering stones replaced, the chambers cleared out, and the entrance repaired; so that now this interesting relic of pre-historic times is again accessible, and may long remain in good preservation.

Mr. WALTER LAWRENCE exhibited a curious latten or copper bowl, engraved in compartments with rude figures illustrative of the story of Orpheus and Euridice, with explanatory Latin inscriptions. This singular vessel was found in sinking the abutments of the Haw Bridge over the Severn, in 1824, and has been described in the *Archæologia*. From the style and costume, it would seem to be Anglo-Saxon of the 10th or 11th century.

The party visited the Museum of the Proprietary College, which, though but recently established, contains much of real value and interest, and offers an excellent nucleus for further amplification.

Dinner was served at the Queen's Hotel, to which about forty sat down. After dinner, Mr. ETHERIDGE, F.R.S., communicated to the Club some of the results arrived at by the labours of the Royal Commission appointed to examine into and report upon the Coal and Coal-fields of Great Britain and Ireland—their extent, the quantity of available coal in them, and the probable duration of supply. Mr. ETHERIDGE confined his attention to the Gloucestershire and Somersetshire coal-fields only. This area was selected as being of local interest, and also as coming within the scope of the labours of the Cotteswold Club. Mr. ETHERIDGE's knowledge of the physical structure and history of the area from Tortworth to the Mendip Hills, or that portion known as the Coal-basin proper, enabled him to bring under the notice of members of the Club many points of interest and importance as brought out through the elaborate enquiry and detailed work of the Royal Commission. Mr. ETHERIDGE stated that the national importance of the question had not been generally or sufficiently known to the people of Great Britain, and that the £30,000 spent in investigating and bringing to light the hidden resources of the country was an item in the State expenditure utterly insignificant when compared with the results arrived at, placing, as it has done, reliable data as to the country's wealth and resources in the hands of the legislature and the people.

The Bristol or Somersetshire and Gloucestershire basin is one of 13 districts whose details have been mastered in respect of its coal-bearing and coal-yielding capabilities, both in reference to past extraction and to future stores of fuel adapted to sustain and further our position as a great and prosperous commercial nation.

The Coal Commission, through the labours of J. PRESTWICH, Esq., F.R.S., have obtained detailed information relative to 65 seams of coal and 83 collieries (old and new) in this coal basin, which occupies an area of 312 square miles, and about 153,000 acres, 31,000 of which containing coal are exposed and worked at the surface, and 24,110 acres are covered by and worked under newer strata than the coal-measures themselves, or strata which overlie them. The remaining 99,000 are not yet worked or touched.

Mr. ETHERIDGE described the relation of the two series of coal deposits in the coal basin, which are divided by the "Pennant" rock, a great series of Sandstones, 2000 feet thick, dividing the Upper from the Lower Coals, acting both as a physical or natural as well as an economically impassible barrier in the centre of the basin to the Lower Coals of the Radstock and Coal-Pit Heath areas. This great belt of Sandstone is also represented in the South Wales coal-field, and occupies the same geological position.

In the Upper Coal Measures of Radstock, Farmborough, Coal-Pit Heath, and Parkfield, 16 seams of coal occur; in the intervening Pennant, 3; in the Lower series, worked on the north flank of the Mendip Hills, at Ashton, Kingswood, Yate, and Cromhall, from 25 to 30 occur. The 16 seams in the Upper Measures (above the Pennant) give the united thickness of 27 feet. The 'Pennant' Rock, although 2000 feet thick, only yields five feet of workable coal, and the 26–7 seams under the Pennant about 66 feet—or nearly 100 feet of workable coal occur in the area known as the Bristol, or Somerset and Gloucester, coal-field, which stretches from Cromhall to the north flank of the Mendip Hills.

Mr. Etheridge claimed the attention of the Club to some of the statistical facts connected with the wrought and unwrought quantities of coal in the basin, showing that the Royal Commission had been able to gather statistically, and upon reliable data, that no less than thirty-five millions of tons of coal had been extracted from the Somersetshire, or Radstock and Faringdon area, and fifteen millions from the Upper series of Gloucestershire, or the Coal-Pit Heath and Parkfield area; and this in the north tract, from only four seams. From the Pennant in the Nailsea Field, only 437,000 tons, and north of Kingswood 722,000 tons; or united, this centre barrier has yielded only 1,210,006 tons. It appears also that the Lower Measures of the coal-basin had yielded, up to the time of enquiry, no less than 58 millions of tons of coal—the area from whence it has been extracted being Vobster, Mells, Holcombe, Sutton, Timsbury, &c., on the south; from the centre area at Ashton, Bedminster, Nailsea, &c.; and from the northern tract at Kingswood, Stapleton, St. George's, Yate, Cromhall, &c. This, with an additional five millions of tons for which no proper records or reliable data were to be obtained, gives 114 millions of tons of coal which have been wrought in this little exposed coal-field. No less than 106 parishes occupy the surface, out of which 74 contain coal, and in 57 it is worked.

Mr Etheridge then entered upon the question of the great unworked stores still unwrought and awaiting the application of labour and capital, and noticed the probable extension of the northern coal-field west of Almondsbury, occupying the Valley of the Severn, between Portskewett and Almondsbury; the presence of the coal-measures having been already determined by Mr. Richardson, C.E., in the Severn, about 100 feet below the Red Marls.

The Royal Commission have arrived approximately at the fact (based upon close research) that in Gloucestershire alone we have resources of untouched coal to the amount of 1,230,000,000 of tons, and that in the richer field of Somersetshire, no less than 5,717,000,000 of tons, making a total of 6,947,000,000 of tons, for the future supply and use of the people in this one coal-field. Deducting 1,000,000,000 of tons from the above as a possible source of error, it leaves 5,947,000,000 of tons of available coal, which the advance of science and high mechanical application may enable us in time to reach.

It must be borne in mind that the coal hitherto extracted (114,000,000 of tons) has been obtained from a depth not exceeding 1,500 feet out of 6,000 or 7,000 feet of known coal-measures; and it is questionable if any of the deep coals, or those below 4,000 feet, will ever be worked, this depth being governed by natural laws, which limit the capabilities of human labour, it being found that at a temperature of 98° (or that of the blood) in moist air, no sustained power of work can be got out of man by which he can carry on continuous labour.

Mr. Etheridge further entered upon the question of the duration of the remaining unwrought coal in the basin, as based upon the total output at the present rate of yield, assuming it to be on reliable data at the rate of 1,000,000 of tons per annum. This quantity, although small as compared with other coal-fields, may be increased to any amount if needed; but assuming the store in the entire coal-field to be nearly 7,000,000,000 of tons, and the known yield at 1,000,000 tons per annum, there is sufficient coal to last nearly 6,000 years, or, taking the quantity known to the depth of 4,000 feet, which is 4,219,000,000 of tons, the period of duration at the same rate of yield may be computed at 4,000 years.

Looking, therefore, at the supply thus measured, as based upon known quantity, rate of extraction, and depth to which in future coal may be won, it is convenient, according to the Royal Commission, to divide the coal-measures of the basin into zones of depth, and then estimate for extraction and distribution; bearing in mind, however, that below the zone of 3,000 feet the ingenuity of man must be taxed to the utmost to realize those yet deeper seated stores of coal. The zones of depth assigned by the Royal Commission give the following assumed and approximate quantities of coal contained in them:—

At a depth not exceeding 1,500 feet occur	1,718,791,281 tons
Ditto between 1,500 and 3,000 feet do.	1,519,997,981 tons
Ditto do. 3,000 and 6,000 feet do.	2,227,531,577 tons
Ditto do. 6,000 and 9,000 feet do.	637,990,144 tons
Total	6,104,310,982 tons

Or, taking as before the total known available quantity to the depth of 4000 feet to be 4219 millions of tons, and believing that to be the limit of extraction under existing appliances, at the rate of 1,000,000 of tons per annum, we may infer that 4000 years will elapse before coal to that depth will be exhausted. The largest quantity of coal lies at the depth of from 3000 to 6000 feet; but until the shallower measures are exhausted, this will probably remain untouched. In future years, however, as our wants increase and our experience becomes greater, there would appear, under the advanced appliances of scientific research, no insuperable difficulty in reaching and working coals at depths between 4000 and 6000 feet.

Mr. Etheridge further entered into and described the speculations as to the probability of the Bristol coal-field being repeated to the east of its present known limits, and also south of the Mendip Hills,—it being a growing opinion in the minds of many physicists that eastward, upon the general strike or bearing of the axis of the Mendips, and beneath the counties of Wilts, Sussex, and Kent, there may be a prolongation or extension of the coal-field under discussion towards the east, to meet a corresponding westerly extension of the Belgian and North French coal series—such, indeed, as might have constituted the old terrestrial surface prior to those changes which cover up and conceal the palæozoic rocks which must undoubtedly underlie the S.E. of England, and which it is hoped we may ere long be able to correlate with those of the area brought under the notice of the Cotteswold Club.

The first Field Meeting for the season took place, by invitation from Miss Strickland, at

APPERLEY COURT, NEAR TEWKESBURY,

on Wednesday, 15th May.

The programme for the day embraced a visit to the Abbey Church at Tewkesbury; the "Battle Field" in that neighbourhood; and the ancient Church of Deerhurst. The party first visited the grand old Abbey, where a paper descriptive of this fine Church was read by the Rev. Canon Davies, who obligingly acted as guide over all the most interesting parts of the building. From Tewkesbury the party proceeded, passing over the field known as "the Bloody Meadow," to Tewkesbury Park, the residence of Mr. Sargeaunt. Here ladies and gentlemen formed a semicircle upon the grass around the Rev. W. S. Symonds, who, from the steps before the drawing-room window, by way of rostrum, and in full view of the ground to which his lecture referred, read a full and well-digested account of the battle which decided the fate of the Lancastrian party on the bloody field by Tewkesbury.

A short walk of two miles brought the members to Deerhurst Church, where a paper was read from the pen of the Vicar, the Rev. G. Butterworth. The Church of Deerhurst, one of the most interesting in the country, is said by Parker to be the earliest *dated* Church in England. It formed part of a Benedictine Priory, founded probably about A.D. 715, and existed as such till the suppression of Monasteries, in the reign of Henry VIII. The Danes burnt it; EDWARD the Confessor rebuilt it, and made it an Alien Priory, subject to the Abbey of St. Denis, near Paris. After its restoration it was consecrated by EALDRED, Bishop of Worcester, in 1056. About A.D. 960 a monk of this Priory became St. ALPHAGE, Archbishop of Canterbury.

From Deerhurst a walk of a mile and a half brought the party to Apperley Court, where the kind hostess had prepared a goodly entertainment, to which more than fifty ladies and gentlemen sat down. After dinner the President proposed the health of Miss STRICKLAND, referring to the many claims that the name of STRICKLAND has for reverence amongst Naturalists, to the kind interest ever taken by her late father in the success of the Field Club, and to the ever-honoured name of her brother, HUGH STRICKLAND, cut off by a lamentable accident in the fullness of his life and talents. The President dwelt especially on his labours among the drifts and gravels, and of the rare prescience with which he, more than twenty-five years ago, first perceived the importance of studying the facts connected with these later deposits, in which at this moment the chief interest of Geologists is centered.

The President then opened the business of the Meeting, by reading a translation he had made from a French newspaper—the *Courrier de Menton*—giving an account of an entire human skeleton lately found in a cave, in the neighbourhood of Menton, which has given rise to much speculation as to its age and history. The skeleton in question was found in a cavern, buried under a bed of earth several metres in thickness, in a remarkable state of preservation. The skull is described as tolerably large, and of a deep brick-red colour, differing in that respect from the colour of the remainder of the skeleton. To the skull were found adhering an infinite number of small shells, all pierced with a hole, which may have been strung on the hair, or have formed portion of a head-ornament. Around the skeleton were found a vast quantity of flint implements, scrapers, arrow-heads, hatchets, and bone awls, worked in a curious manner. Bones of animals, including those of many of the extinct *herbivora* and *carnivora,* were likewise found. Behind the head was a stone, another behind the loins, and between the first stone and the head were found two stone implements of the largest size yet found in the caves. It is important to note these discoveries one by one as they are made, as it is out of the total of these finds that new light has been brought to bear on the history of those pre-historic races of men that lived in Europe after the Glacial epoch—aye, and possibly long before that remote period—whose records, hidden away in caverns and fissures, in gravels, in silted-up lakes, and in peat-mosses, are year by year yielding up fresh evidences out of which a new chapter in the history of man will one day most surely be written.

Dr. WRIGHT introduced some remarks on a new species of *Uraster,* from the "Forest Marble" of Road, in Wiltshire, by observing that so diligently had the oolitic rocks of our own and neighbouring districts been searched that it was rare to find any new forms of ancient life; lately, however, he had received from Dr. PARSONS, of Bath, a fossil which was quite new; it was a small star-fish, from the "Forest Marble" of Road, Wilts. Dr. WRIGHT observed that it was interesting to note how little these extinct species of star-fish differed from those on our own shores, and how clearly the characters of the genus *Uraster* were displayed in the new fossil species before them. Some genera or kinds of animals had lived through very long periods of geological time, whilst others had a comparatively brief span of existence. One of the *Urasters* from the Lias differed so little from the *Uraster rubeus* now living on our own shores that it required the practised eye of a trained Naturalist to detect the differences between them; whilst other congeneric forms of the same class have no living representatives. This is one of those interesting problems which engage the mind of the philosophical student of nature—the persistence of certain types and the non-persistence of others; for the time when this now extinct star-fish lived was so remote that we could form no idea of its immensity. As well might we try to estimate the distance of the nearest fixed stars from the earth as to endeavour to compute by thousands of years the age of the Oolites of the Cotteswold Hills ; and yet through all those untold cycles of ages organic nature had been producing the same generic forms so beautifully displayed in this little fossil *Uraster*. Similar facts come before us among the Mollusca; for in the pearly Nautilus we have the last descendant of a long line of chambered shells of the same type which began their career in the far, far distant periods of Silurian time, which was probably as much older than the star-fish as the latter was removed from our day, and yet the organic family type was as well exhibited in the oldest as it is in the newest Nautilus, whilst other chambered shells, near allies of the Nautilus, the common Ammonite for example, after flourishing in vast profusion during the Jurassic and Cretaceous periods, had suddenly become extinct, and left no representative in the Tertiary seas. In like manner, the genus *Lingula* appeared among the earliest forms of Silurian life, and had transmitted one of its species into the present Molucca sea; this remarkable genus, having survived through all this vast lapse of time without changing in the slightest essential any of its primitive generic characters, whilst side by side with these persistent *Lingulæ* whole families and genera have died out without leaving a single living representative.

The second Field Meeting of the Club was held at

ROSS,

on Wednesday, 19th June, with the especial object of visiting certain caves on the Great Doward, near Whitchurch, which had yielded very remarkable results to the labours of the Rev. W. S. Symonds, whose researches had been indefatigably carried on at that locality for some months previously.

The discoveries made by Professor E. Dupont, of Belgium, in the caves of the Lesse Valley, near Dinant, occurring contemporaneously with those which, under the direction of Mr.

Pengelley, had yielded such interesting and important results at Brixham and Torquay, caused the attention of enquirers to be directed with especial keenness to those localities where similarity of geological conditions seemed to offer to explorers a favourable opportunity of realising like results.

A prominent feature in all these cave discoveries, and one that must at once strike the observer, is this—that without exception, at Kirkdale in Yorkshire, at Banwell and Wookey in Somersetshire, as in Belgium and South Devon, it is in the Carboniferous Limestone that the cavities occur in which have been accumulated the remains of animals now extinct, in many cases in association with evidence of man's presence, either in rude stone implements, or, as in the Trou de la Naulette in Belgium, in human teeth and bones.

It was a consideration of these facts which led the Rev. W. S. Symonds to speculate on the probability that the Carboniferous Limestone rocks which guard the course of the Wye between Ross and Monmouth, and which are known to be pierced in many places by caverns, might be found to yield additional corroboration of the facts above referred to. With this view, in company with your President, a great number of caves were examined without any success, and the matter had been permitted to sleep, when information was received that a party of miners had found some bones in a cave on the Great Doward. A visit to the spot revealed the value of the find, and measures were at once taken to follow up the clue thus furnished. Permission was obtained from Sir James Campbell, the supervisor of the Crown lands on which the cave is situated, and last summer excavations were commenced in Arthur's Cave on the Great Doward, which have since yielded such gratifying results in the discovery in large quantities of the teeth and bones of Mammoth, old and young, Rhinoceros, Cave Lion, Cave Bear, Hyæna, Irish Elk, &c., and, in intimate association with these, the flint knives and scrapers, of that ancient race of men who in those far-off times shared with these strange beasts the possession of the country, the features of which probably differed greatly from those which at present meet the eye.

These discoveries prompted further research in the same direction, and two caves have since been opened in the same escarpment of rock, but at a higher level, following the lie of the beds, which dip at a considerable angle towards the River Wye. These caves are both situated on the domain of Mr. Bannerman, a neighbouring proprietor, who has prosecuted his investigations into their history with praiseworthy zeal, and has been rewarded by some interesting discoveries, though not as yet of the extent or value of those yielded by Arthur's Cave.

It was with a view to examine these bone-caves that the Cotteswold Club assembled on the 19th June last. On their arrival at Whitchurch, they found displayed in drawers for their inspection a splendid array of teeth and bones from Arthur's Cave, to which Mr. Bannerman had likewise contributed the results of his excavations in the two caves on his property.

Having thoroughly examined this interesting collection, the party, under the guidance of Mr. Symonds, proceeded to the caves, less than a mile distant, and most picturesquely situated in a face of rock at a considerable elevation—275 feet above the Wye—overlooking a scene of wooded hills of great beauty.

In Arthur's Cave the succession of deposits was as follows:—1. Black earth, containing portions of two human Skeletons, teeth and bones of Beaver and Bear, and coarse Pottery. 2. An arenaceous stratified deposit, four or five feet thick, containing occasional rolled pebbles—and lastly, a floor of stalagmite, from two to three feet thick, beneath which were found the mammalian remains, together with the flint flakes which have been already referred to.

Arthur's Cave appeared to be pretty well cleared out, and the workmen had discontinued their operations there; but at Mr. Bannerman's caves explorations were still in progress. These caves presented a very similar succession of phenomena to those of Arthur's Cave, with the exception that the arenaceous deposit in the latter was largely replaced by a tenacious blue clay. In Bannerman's Cave No. 2 (the middle cave) the following sequence was noted:—1. Superficial earth, with rude pottery.

2. Arenaceous deposit as in Arthur's Cave, with blue clay intermixed, at the base of which and above the stalgamitic floor, (which had not then been pierced,) in a crevice were found molars and teeth of Mammoth, Rhinoceros, and Hyæna. It is remarkable that in this cave the bones of the extinct beasts were found overlying the stalagmitic floor, instead of being covered by it as in Arthur's Cave; but Mr. Symonds gave it as his opinion that there were evidences of the presence of an upper thin floor of stalagmite, which had been broken up by the miners in quest of minerals, and through which cause this cave had suffered great disturbance.

The third Field Meeting of the Club, on Tuesday, 16th July, had for its object the examination of that portion of the Bristol Coal-field which adjoins the

MANGOTSFIELD STATION

on the Midland Railway.

It is probable that few indeed of the tens of thousands who pass the Mangotsfield Station ever cast a thought towards the great face of rock, seamed with a vein of impure coal, which there presents itself to view; yet does this rock tell a tale of no ordinary import to him who has eyes to see and ears to hear. The hill, of which this boss is the substructure, is called Rodway Hill, and is itself a key to the geological history of the Bristol Coal-field. It is a portion of the great mass of so-called "Pennant" Sandstone, 1500 feet in thickness, which forms the diaphragm between the upper and lower coal-basins of the Bristol area—that of Coal-Pit Heath and Parkend to the north, overlying the "Pennant;" while that of Kingswood to the south lies below it.

It was for an examination of this interesting district that on the 16th July the Cotteswold Field Club met at the Mangotsfield Station. Here they were joined by Handel Cossham, Esq., and many other gentlemen, and under their guidance and that of our colleague, R. Etheridge, they proceeded to explore the middle portion of the Bristol Coal-field.

Ascending to the summit of Rodway Hill, Mr. ETHERIDGE, by the aid of maps and sections, explained the relations of the "Pennant" to the coals above and below it. The lower Coal-measures of Kingswood Hill, and their relations to the upper measures of Coal-Pit Heath, through the intermediate "Pennant," being well shewn and clearly apprehended.

Quitting Rodway Hill, Mr. COSSHAM pointed out the position of the outcrop of the "Hard," "Top," "Hollybush," and "Great Veins," now extensively worked over the Coal-Pit Heath area.

Leaving the Mangotsfield district, the New Red Sandstone and Lias of Shortwood Hill and Pucklechurch were traversed, passing by the way the fine old Manor-house of Siston, the examination of whose small but interesting Church delayed the party for a few minutes. It contains a south porch of "Decorated Norman," in good preservation, besides other curious features; but it does not seem to have been well cared for.

The lower Coal-measures of Webb's Heath and the numerous old coal-shafts and pit-heaps, indicative of old workings, were passed and noted as far as Bridge, or more properly "Breach" Yate, thence due east over Horncapple and Riddingbourn Hills to Wick Rocks. This latter point is one of extreme geological interest, affording at the same time an opportunity of studying the most easterly known extension of the carboniferous rocks of the Coal-basin, and of examining the singularly faulted and reversed position of the strata comprising the south-eastern border of the northern Coal-field. This reversion is due to two parallel N.W. and S.E. "faults," which have brought the Carboniferous Limestone from beneath the "Millstone Grit," and thrust it through the mass of that rock; thus at the surface exposing the "Millstone Grit" on both the east and west flanks of the "Carboniferous Limestone," they all dip at an angle of 60° S.W. The Wick Valley has a fringe in patches of "Dolomitic Conglomerate" along its two sides.

The action and influence of the east "fault" have produced a considerable number of fissures and veins in the limestone, now filled in with crystalised carbonate of lime;—the whole a study in itself, and demanding more time than could be devoted to it in a short visit. The Wick Rocks alone would well repay more than a day's devotion to their history.

This classical spot was quitted with regret, but only for matter of fresh, it may be said of *deeper* interest; for under the guidance of Mr. COSSHAM the party was conducted to the Kingswood Pit, the property of that gentleman, where they were invited to descend the shaft, and to examine below, the seams of coal which they had passed over on the surface. About a dozen or so were "caged," and descended some 1500 feet to inspect the "Giller's End" and "Five-Coal" seams at the bottom of the shaft. The relation of the seam of coal to its roof and under-clay, and to the associated strata, were explained in detail by Mr. COSSHAM; and the least initiated must have quitted the recesses of the mine wiser if not better men.

Having learnt something of the nature of that fossil fuel which ages ago flourished in a tropical forest, was converted into coal, and is here stored to be the source to-day of the wealth and power which so pre-eminently characterize Great Britain, it was felt how little even educated people know of the internal resources of their country. How little is known of those laws and those phenomena which prevailed in the remoter periods of the earth's history, and of the growth and deposition of this one item of national prosperity. Order, system, energy, industry, science, were everywhere visible in the well-appointed under-ground workings, where nature is seen under one of her sternest aspects, and strong men are day and night toiling face to face with danger, but danger minimised or averted by science, and that so successfully, that during a space of seven years only one life has been sacrificed in these workings.

One and all reached the surface safely; and all the party were then invited by Messrs. COSSHAM and WETHERED to partake of a substantial cold dinner in the large room of the works. May the Club never fare worse than on that occasion! They were never more heartily nor more hospitably received, and though apology was made for the "rough and ready," none was needed.

The toast of "The Queen" having been loyally honoured, Mr. Cossham briefly referred to the ground they had that day gone over, and gave a few statistics of the resources of the Coal-measures of that part of the basin, stating that 40,000,000 of tons of unwrought coal yet remained in Kingswood for future use, but that much yet remained to be done fully to develope the resources of the district. He strongly advised that the Club should, in order to complete their survey of the district, examine the line of railway-cuttings between Mangotsfield and Bath, returning by boat up the Avon;—a delightful excursion, which may, it is hoped, be practically developed in this year's programme.

On the way to the Station at Mangotsfield an accident occurred which, fortunately, was productive of no ill consequences beyond a severe shaking. While proceeding leisurely along, the carriage, in which were seated the President, Vice-President, Mr. Etheridge, and four or five others, without the slightest warning, parted suddenly in two, bringing the occupants to the ground with a sharp shock. Fortunately, beyond a few bruises, no harm was done; and the party reached the Station just in time to save the train to Gloucester.

The last Field Meeting of the season was held at

MORETON-IN-THE-MARSH,

on Thursday and Friday, 22nd and 23rd August, 1872.

The district lying round Moreton has become classical ground to the Cotteswold Geologist since the publication in our Transactions of Mr. Lucy's able and exhaustive paper on "The Gravels of the Severn, Avon, and Evenlode."

The district is somewhat remote from the more central part of the county, and this circumstance, joined to certain difficulties of communication render more than one day needful for the due exploration and examination of the points of greatest interest; these difficulties, indeed, on a former occasion rendered a proposed meeting at Moreton nugatory. On the present occasion, however, I am happy to say it was not so; and a small but select band of Members met the Vice-President, Mr. Lucy, who had preceded them by a day, in order that no unforeseen delay in respect of vehicles might obstruct their progress.

Their first visit was to the "Poor Lots," where they inspected the large pit of which a section is given in page 31 of Mr. Lucy's paper. Their attention here was especially directed to the evidences of a remarkable force there exhibited, which has had the effect of throwing the long axes of the elongated flint pebbles into a vertical position—the effect of a powerful lateral pressure. They then visited in succession pits at Barton-on-the-Heath, at Little Woolford fields, and at Pepperwell buildings. At the latter locality, a pit which had become classical to geologists from having yielded to Dr. Buckland examples of red chalk from Lincolnshire has been closed within the last four years.

Passing through Todenham, and crossing the old Roman Foss Way, the party shortly afterwards turned along a lane which leads to Paxford, where flints occur in great abundance; and then on to the important railway-cutting at Aston Magna, described many years since by Mr. Gavey, who was the engineer of the railway. Here very large flints are to be seen, and in addition to the Northern Drift, there are large accumulations of oolitic gravel from the near hills. The time available for the examination of this important section was far too short, considering how suggestive it is of the vast changes which have taken place even in comparitively recent geological history, and how full it is of evidence of Glacial action. The great quantity of flint seen during the day is but a small indication of the amount of denudation which must have taken place in the chalk from whence it has been derived; for, according to Sir John Lubbock's calculation, each foot of flint represents 20 cubic feet of chalk.

The close of evening compelled a return to Moreton, where the party found comfortable quarters at the White Hart Inn. After dinner, an adjournment was made to a larger room, where Mr. Lucy had hung up his map and sections, and at the request of the Members he gave a short description of the district passed over during the day, and indicated what was to seen on the morrow. Dr. Wright observed how clearly what he had witnessed that day had reminded him of the evidences of Glacial action he had noticed in his recent investigations in Scotland, and remarked that Glacial Striations would be as clearly visible in the rocks of the Cotteswolds, were it not that they are composed of so soft a material.

At nine o'clock next morning the carriages were again in requisition to drive to Stow. Having seen the Church, they next visited Daylesford, sacred to the memory of the great Indian statesman, WARREN HASTINGS, whose remains repose in the parish church. From hence the party proceeded to Chastleton, a former residence of the Catesby family, whose name is mixed up with the infamous "Gunpowder Plot." Mr. WHITMORE JONES, the present proprietor, gave them free access to the house and adjoining church; the latter contains some good brasses. The house is a grand example of the stone mansions of the Jacobæan period. Only a portion is at present inhabited, but noble suites of apartments, now falling into decay, remain to shew the splendid taste of the wealthy territorial families 250 years ago.

In the keeping of the present proprietor are preserved two curious relics of Charles the 1st. (1) The Bible which he gave to Bishop Juxon, who resided in the adjoining Parish of Little Compton; and, (2) A curious set of miniature paintings on talc, or Mica, of Charles 1st, in different costumes, one head or face being adapted to each costume so that he may be seen by merely adapting the head to each figure—in his walking costume—as crowned King—in armour—in the dress he wore at his trial—in his dressing gown, as he appeared when a prisoner at Carisbrook—and in the dress he wore on the scaffold. This singular collection of effigies was found concealed behind a wainscot in the house.

Here the party was joined by Mr. COOKE and Mr. BALDWIN, and a return to Moreton took place.

After dinner the Secretary called attention to the difficulty of getting papers read at the Field Meetings, for lack of time: and it was suggested that, during the winter, evening meetings should be held for the reading of papers. This proposal was warmly received, and Dr. WRIGHT undertook to read the first paper.

On the Recent Calcareous Deposits of the Cotteswolds. Read at Gloucester, March 6th, 1873. By G. F. Playne.

In the study of the older formations which compose the crust of our globe we find such abundance of interesting detail in the composition and disposition of the igneous rocks, and of the sedimentary strata, with their innumerable enclosed organisms, to engage our attention, and are so impressed with the magnitude of the deposits which have taken place, and with the lapse of time necessary for such vast and varied changes to have resulted, that we are tempted to think lightly of those geologic changes which are occurring in our own time. And yet it is by accurate observation of the mode and effect of existing agencies that we arrive at just conclusions as to the means by which the older formations have been produced. In this way is it that of late so much light has been thrown on the subject of former denudation, by noting the effects of rain and rivers on the present surface of the earth. In this way, as so ably brought before us at our last meeting by Dr. Wright, many difficult problems are solved regarding the former glaciation of lands which now enjoy temperate climates, by a reference to the action of existing glaciers. In this way many of those thinnings out of particular strata, and those changes in mineral composition, as well as in the character of their enclosed organisms, which form such striking and often perplexing problems when such strata are studied over extended areas, may be explained by a study of the deposits now taking place in our existing seas and oceans, and by observing the effect of the action of existing currents and tides on these recent deposits.

In some degree, I trust, the subject of this paper, by pointing out geologic re-formations now taking place, may illustrate some of those combined chemical and mechanical operations which have led to the deposition of many of the older strata.

Turning, then, to some examples which our own district presents, we find traces of a recent deposit of an impure Carbonate of Lime, or Calc-tufa, connected with many of the streams issuing from the Cotteswolds. Frequently around a spring, or at the sides of a little streamlet in the higher parts of our combes and valleys, stems, leaves, and exposed roots of plants may be found incrusted with lime, and occasionally considerable accumulations of this deposit have taken place in such localities; but it is near the bases of the hills that we find far more important deposits, where the quantity of water issuing from these lower springs is great, and where from longer contact with the strata of the hills the water is more highly charged with lime.

One such instance is found at Chalford, where at a very narrow part of that picturesque valley there issue a series of fine springs of limpid water. These springs are very numerous, and extend for about 300 yards along the foot of the hill on the south side of the valley, and at about 30 ft. above the level of the stream which flows down the Chalford valley. Formerly these springs were well seen; but in the construction of the Great Western Railway, about 1842, the sources of most of them were covered over, and much of the water now issues from artificial culverts. When the railway was made a large quantity of Tufa was removed and used for ornamental purposes in gardens and ferneries, and some was used as building material, as in the retaining wall of the embankment of the railway, where may now be seen many squared blocks of Tufa, and on the capping of the wall there are also blocks of it, which have withstood the effects of frost admirably for 30 years.

The occurrence of Calc-tufa at the little town of Dursley and in its vicinity is well known, both on account of the extent of the deposits and from the practical use which has been made of it for building purposes. The situation of this town is highly picturesque; placed in a very narrow valley, and shut in by lofty hills whose broken outlines and deeply indented combes are finely wooded. The Cam river, which flows close to the town, here receives accession from numerous springs, the largest of which, the "Broadwell," rises in the middle of the town. This remarkably fine spring has been the source of a deposit of Tufa, or as it is locally called "Puff," the extent of which has not been accurately ascertained, but it is met with in various places between the spring and the river, and in one spot has been excavated to a depth of 20 feet without reaching the bottom of the deposit. It appears that this Tufa has been quarried for building material from an early date, for JOHN SMYTH, the historian of Berkeley, in his description of Dursley, writes:

"In this Towne is a Rock of Strange Stone, called a Puff Stone, or, as some pronounce a Toufe Stone, wherein is no Chink, Cracke, Chop, or Lisne, at all, like a sponge; of an incredible durance, as the Walls of Berkeley Castell, made of Ruines of the Nunnerye there, demolished neere 700 yeeres agoe, may witness; very easy to be cut, and soft. Through which Rocke, divers Vaults, Houses, Cellars, Milles, and Water-courses, in the Towne are cutt and runne, the like is said not to be elsewhere found; and by it, and through parte of it runneth the stream from the fayre Fountain, called Ewelme, ancientlie in the Time of Henry III, and afore written Hewelme in divers Deedes."

Even LELAND makes mention of this Tufa stone, for when describing Dursley, he writes:

"This Towne hadd a Castell in it sum tyme longynge to the Berkeleys, sins to the Wikys, sins fell to Decay, and is clean taken down. It had a good ditch about yt, and was for the most Parte made of Towfe Stone, full of Pores and Holes like a Pumice. There is a Quarry of this Stone about Dourseley, and it will last very longe."

Old LELAND's assurance that this Tufa-quarry would "last very longe" has proved correct, for even to the present day the Tufa blocks taken from it are used not only for garden walls and ornamental entrances, but for building houses. Near the Railway Station is a large house, erected in 1861 by Mr. EDWARD GAZZARD, the walls of which externally are of Tufa; and two small houses were built near "the Priory" in 1865, the walls of which are faced with this material. In all situations it proves a perfectly durable stone, unaffected by frost, and although often very porous, bears great pressure without crushing.

In order to explain the causes which have led to the deposition of Calc-tufa at Chalford and at Dursley, and why in those localities the waters of the springs so soon part with their recently acquired Carbonate of Lime, it is well to study the like results in some small spring—as, for instance, one near Nailsworth, which is thrown out by the Upper Lias, and whose waters, being derived from the rainfall on an extended slope of the Inferior Oolite, are charged with Carbonate of Lime. The water from this spring passes over a series of miniature falls, at the first of which the water runs down stones, and there a deposit of Tufa takes place on the stones over which the water trickles. The next is a clear fall from the edge of a slab of stone on to another slab placed three feet below, and then again to a pool. Round this fall *Hypnum commutatum*, the "Curled Fern Feather-moss," is growing. This moss, which has its specific name from its being frequently found so incrusted with calcareous matter as to appear "changed" into stone, delights in moisture, and grows so freely in and around a waterfall, that though part of a plant may be thus apparently changed into stone; its young shoots grow on, and ever present fresh scaffolding for the support of the increasing mass of Tufa. Other species of mosses and liverworts grow in such a situation, and aid in arresting the particles of lime as the water passes over them. Leaves of plants, numerous insects, shells of land and fresh-water molluscs, become imbedded in the growing mass of Calc-tufa, and by their "organic remains" attest the recent date of the "formation."

The rate of increase of a mass of Tufa must necessarily vary with circumstances, but in the fall above mentioned the growing plants of *Hypnum commutatum* have become "changed" to the extent of one yard in depth during the last year.

By observing the mode of deposition of Tufa in a small stream, and finding that it is when the waters containing Carbonate of Lime are spread out in a thin stratum so as to permit escape of the carbonic acid and evaporation of the water that a deposit of Tufa takes place—and to obtain this a fall of the waters is required—it is at once seen that such conditions must have prevailed to cause the large deposits at Chalford and Dursley.

It may appear remarkable that so few beds of Tufa have been found in connection with the streams which flow from the calciferous strata of the Cotteswolds, streams which in their higher parts have generally a rapid descent, but this is in consequence of the little resistance presented by the rock beds of our Oolites, not one of them being capable of long maintaining a ledge sufficient to produce a waterfall. On the river Frome and its tributaries more than one hundred mill-falls have been obtained by artificial means; but it is probable that not one natural fall of their waters existed for any considerable length of time.

The deposits of Tufa at Chalford and Dursley have not taken place from the waters of the principal streams which flow past those localities, but from the water of springs which from special causes have obtained precipitate falls before joining the main streams.

At Chalford the rivulet which comes down from the Sapperton valley after passing for five miles over the rock beds of the Inferior Oolite there, cuts through the yielding Oolitic Sands, in which it has a narrow channel. On both sides of the valley, the hills, which rise very steeply, are considerably affected by faults, which probably have much to do with the position of the fine series of springs already mentioned, whose waters burst out in such abundance on the south side of the valley at an elevation of 30 feet above the level of the stream, and which, in the course of their short passage and rapid descent to join the stream, formerly deposited Tufa in such large quantities.

From somewhat similar circumstances a fall of water has formerly existed at Dursley. The Cam river, after passing over the Marlstone, there cuts into the more yielding beds of the Lower Lias; the Broadwell spring, whose waters are derived from rainfall on Stinchcombe Hill, in their passage to the Cam had to pass over the Marlstone, the rock bed of which probably presented a hard ledge sufficient to cause a precipitate fall, around which the ancient deposit of Tufa was formed. The Broadwell stream has since been diverted so as to form falls for two mills in its short course before it joins the Cam, but at the weir which carries off its surplus waters a deposit of Tufa is now accumulating.

It is possible that other considerable deposits of tufa besides those at Chalford and at Dursley have taken place in our district, and are covered up by landslips or by vegetation, and it is certain that there are many springs capable of producing such deposits if only the requisite conditions existed. Considering the value of this material for building purposes, a value so well understood by the builders of ancient and modern Rome, as proved by the great use they made of recent deposits of "Travertine," it is a question whether Calc-tufa might not be profitably produced by artificial appliances. To a proprietor of an estate possessing abundant springs charged with Carbonate of Lime, an artificial disposition of their waters with a judicious planting of *Hypnum commutatum* might be as profitable an investment for futurity as the planting of oak trees.

There are other forms of calcareous deposit to be mentioned beside that of Calc-tufa—namely, such as take place by the action of percolating water in the strata of our hills. Much of the Carbonate of Lime resulting from this action is immediately re-deposited as *Calc-sinter* in the rocky beds of the Cotteswolds, coating the sides of crevices, and forming stalactites; and in the strata, which are formed of small rubbly stones, the effect of an infiltration of this Carbonate of Lime is often to convert such beds into a mass of rude conglomerate. In many quarries the strata are found thus "callised" as the workmen term it, and whilst this has added to the labour, it has also added to the safety with which these quarries can be worked. In the Cotteswolds the stalagmitic deposits of Carbonate of Lime are of little economic value, but specimens are occasionally met with which *illustrate* the mode of formation of many valuable marbles, such as the beautiful "Onyx marbles" of Algeria. A specimen of Calc-sinter from Woodchester Park has *such* a compact subcrystalline texture and concretionary structure, the successive layers of deposit varying in colour owing to their containing extraneous matters in varying amounts.

Calc-spar is frequently met with in the various strata of our hills, occuring in fissures of the rock-beds, as veins in stones, (formed probably in cracks,) in the interior of fossil shells, and in other situations which have afforded space for the crystals to form. These crystals are seldom transparent, being generally tinged in colour by iron or other impurities.

This subject leads to some considerations of interest regarding the abstraction of Lime from the existing strata of our hills. It would require much accurate observation of the chemical character of the various streams which flow from the Cotteswold Hills, and careful gauging of the volume of their waters, to ascertain even approximately the total weight and bulk of Lime annually abstracted. The portion re-deposited as Tufa is infinitesimal compared with that which is borne to the ocean in an invisible combination with the waters of the Severn, the Avon and the Thames. From experiment, it appears that even the Broadwell stream at Dursley carries away at least eighty tons per annum, and this shows how great the total quantity must be. Year by year this loss is scarcely perceptible; but in the review of past geologic periods may we not see here an agent by which, in connection with others, vast ancient deposits have been disintegrated and conveyed for re-disposition in the beds of ancient oceans? In this manner may not the lime which forms so large a portion of the Lias of our vale and the Oolites of our hills have been abstracted from pre-existing lands, where situate we, as yet, know not, and have been invisibly conveyed by streams, rivers, and ocean currents, and then through the high temperature of the existing waters have been disengaged and deposited on the floors of those ancient oceans—in the case of the Lias in a calm still ocean, whilst in the case of the Oolitic ocean, the waters were probably in a sufficiently disturbed condition to hold in suspension minute organic and inorganic particles, to which the Lime, when set free, attached itself, forming the roe-like grains which give to the Oolites their peculiar character. The rivers which thus bore their invisible freight of lime also carried other inorganic atoms, as well as occasionally organic remains from the distant lands, with pebbles of various old formations, the result of external denudation, and deposited these in stratified order with the multitudes of Molluscs, Cepholopods and Saurians which lived and died near the spots where their remains are now found, whilst at the same time a chemical work of cementation was taking place, producing under varying circumstances those wonderful alternations of shale and stone which are exhibited in many a section of the Lias. In such sections a few feet of Shale composed of exceedingly thin layers, "leaf-like laminæ" as Hugh Miller styles them, so friable as to break and crumble on the slightest pressure, are succeeded by a band of a very compact Crystalline Limestone, this by Shales, and these again by stone—it may be less crystalline, but still very compact. To account for such varying results in the deposition of Carbonate of Lime, what a constant recurrence of varying agencies, mechanical and chemical, must have prevailed.

If in the study of this subject it is attempted to trace out the possible history of the atoms of Calcium, which are found in some specimen of recent Tufa, what an illustration may it afford of the wonderful story of the changes which have taken place in the crust of the globe. For instance, a spray of moss recently incrusted by Carbonate of Lime, the atoms of Calcium in which have just now been extracted by water from their long rest in the Oolite beds, where they have lain during the vast lapse of time since those strata were deposited, time which has sufficed for the formation of the upper members of the Oolitic system and the Wealden, and all the members of the Cretaceous and Tertiary systems, and for those great superficial changes which have taken place during the Quarternary period. And what parts may these atoms of Calcium have played before they attained their late position in elevated beds of Oolite? Some, perchance, as they floated in the waters of the old Oolitic ocean, may have been secreted by a limpet, and appropriated to the enlargement of the shell which protected and sheltered that ancient Mollusc, as it glided over the submerged rocks, or lay firmly adherent to exposed rocks on the shore, waiting the re-flow of the tide. The shell after the death of its constructor, after being tossed hither and thither by the waves, its prominent edges worn off by striking against rocks and pebbles, was covered up by the ever thickening deposit on the bed or on the shore of that ancient ocean. And tracing back the possible history of these atoms,—they may only have reached the Oolitic seas after a long transit by river and streamlet from a former resting place in some Silurian rock which ages before had been upheaved from the bed of an old Silurian ocean, and now was undergoing slow disintegration. From the waters of that ancient Silurian ocean these atoms of Calcium may have been secreted by a Zoophyte, and have been built up into one of those many beautiful corals which there abounded. Nor would the history of these atoms stop here, for probably long ere they assumed a solid form they have circled the globe in a gaseous state. Of any of the solid matter of the globe can it be said—"See, this is new. It hath been already of old time, which was before us."

If a slight digression is permissible, this subject may suggest some reflections on the acquisition of scientific knowledge. Physiology teaches that the human body is but an agglomeration of atoms, which are ever changing—atoms which, like those of which Tufa is composed, have played their part in many a character and in various scenes before they reached their present position. And is it not thus with scientific truth, with those items of information, with those conclusions which together make up the sum of the store of scientific knowledge? In how many a brain have these atoms of knowledge found a previous lodgment? In reading the records of early Geologic students how striking is it to observe how much those old "Fellows" knew, and how well they knew it. And so with Antiquarian lore, how much old Pennant and others knew of matters which are now sometimes brought forward as new. But as in the old geologic strata, which consist of atoms, all, it may be, equally old, there occur ever and anon new creations of organic life, in which are traced that onward and upward progress from lowly types of existence to those of higher forms, so to the stock of ascertained scientific truth are there from time to time added those new discoveries which reward the diligent searcher after truth, and which form waymarks to the onward and upward path of knowledge.

Annual Address to the Members of the Cotteswold Naturalists' Field Club, read at Gloucester on Thursday, 12*th March,* 1874, *by the President,* Sir W. V. GUISE, Bart., F.L.S., F.G.S.

GENTLEMEN,—

In accordance with our annual custom I have the pleasure of assembling you to-day at the commencement of a new season, and of submitting to you a short statement of our position and prospects, together with a brief *resumè* of the work done during the past season.

I am glad to have it in my power to assure you of the continued prosperity of our Club, and that there is no diminution of interest in those pursuits for the cultivation and advancement of which we are associated.

The Club consists at present of a President, three Vice-Presidents, and an Honorary Secretary; eight Honorary Members, the Presidents and Secretaries of nine Field Clubs, and ninety-one ordinary Members. During the past year we have, in accordance with a resolution passed at a former Meeting, removed the names of four members, for non-payment of subscriptions, and two have retired. In a financial point of view our position is good; for which we are in a great measure indebted to the exertions of our indefatigable Secretary. We commenced the year with a debt of £71 12s. 5d., which is now cleared off. This has been effected by keeping down the expenses as much as possible, and by the collection of arrears. This latter process has yielded no less than £108. Some £20 of arrears yet remains to be collected, which will leave us with a small balance in hand. I am thus fairly entitled to assume that our financial condition at the commencement of the present season is entirely satisfactory, and further, that our position generally is one of entire prosperity, while needing only the exertion of that energy and ability which is latent among us to maintain and even to extend that reputation as a body of scientific naturalists which a comparatively few among us have laboured so successfully to establish.

With these prefatory remarks, I will proceed to give a brief outline of the proceedings of the Club at our different Field Meets during the past season.

On Thursday, 6th of March, 1873,

THE ANNUAL MEETING OF THE CLUB

for the season was held in the Lecture Room of the School of Science and Art, at Gloucester, when the ordinary routine business of the Club was transacted, and the Officers for the ensuing year were chosen, upon which occasion you again did me the honour of calling me to the Chair of the Club. Dr. Wright and Mr. Lucy were re-elected Vice-Presidents, and Dr. Paine again kindly accepted the office of Hon. Secretary.

After the President had read his annual address, Mr. Lucy read a paper on "The Submerged Forest-Bed near Sharpness." After mentioning that Forest-beds occur at the mouth of all estuarine rivers, and are usually seen at low-water mark, more particularly when the silt which covers them up is removed by storms or land floods, he proceeded to describe the beds at Cromer, on the Norfolk coast; the section from the borings at Hull; and the beds at Porlock, in Somerset. He also briefly noticed the beds at Dürnten, Zurich, which resemble in many respects the Cromer forest. He then gave the following account of Holly Hazle: The peat-bed near Sharpness lies in a hollow, resembling very much a trough, excavated out of the lower beds of the 'Old Red' marl, and is cut through by Holly Hazle brook a short distance before it reaches the river. The brook is a small stream, rising about two miles distant in the Ludlow Rock. By reference to the carefully prepared map it was seen that the peat attains a maximum thickness of nearly fourteen feet, which, as it rises to the surface, thins out to a few inches. It is composed mainly of oak, alder, beech, and hazle, and near the surface nuts of the latter were found quite perfect. The trees generally were observed to lie nearly north and south, and at the point where the peat was deepest, they occurred about six feet from the bottom. The wood forming the underlying portion was much decomposed with some fine sand in it. Some oaks were of considerable size, indeed one of them must have been quite a giant of the forest, being 80 feet long, and as at the upper extremity it was still 2 feet 9 inches in diameter, the trunk when entire must have been considerably longer. The base, which was a good deal decayed, gave a diameter of 5 feet. A portion of the stem of this grand tree, cut about 24 feet from the base, is preserved in the Gloucester Museum.

There were no marine or fresh-water shells discovered, and the few remains included a fine head of *Cervus Elaphus*, antlers and jaw-bones of rather small deer, head of horse, horns of *Bos longifrons*, and skull of a dog. The bottom of the peat was about the height of the present low-water mark on the Severn. The highest spring tides rise 44 feet. About eight feet of fine silt, with some clay in it, covered up the peat, which reposed upon a clay, varying from a few inches to four feet in thickness, and so fine in quality as to be fit for potter's work. In it were some "Northern Drift" pebbles, some small boulders, and a little flint. The clay rested on an eroded surface of the "Old Red" Marl, from which formation it had evidently been derived. A few Northern Drift pebbles occur in the peat and also in the silt above. On either side of the Royal Drough, at a depth of about 16 feet, is a continuation of the same Peat-Bed, about six feet thick, and it is met with again a few miles higher up the Severn, at Epney and Framilode, and on the opposite side, at Lydney and Awre; it has likewise been traced at various places up to Gloucester.

In comparing the peat-beds at Cromer, Hull, Grimsby, Porlock and Holly Hazle, it is seen, as might be expected, that the similiarity of the deposits at Porlock and Holly Hazle is very marked. The presence of sea-mud with *Scrobicularia*, which is present at Porlock, being clearly traceable to its estuarine conditions. The exact geological age of the Holly Hazle deposit, Mr. LUCY does not attempt to fix, but suggests that the fine clay at the base of the peat is a portion of the "*boulder clay*," which may at one time have covered, and in some places, perhaps, have filled up our low valleys, and which the tidal action of the Severn has helped to remove.

Mr. LUCY wound up a very able paper by an endeavour to establish the following position. That there was a time when the whole of the land in that part of the Severn valley as seen at Holly Hazle, in the hard beds of the "Old Red" Marl, and in the hard Lias beds at Gloucester and beyond Tewkesbury, was eroded, and this, if not caused by the force which brought the "boulder clay" into the district, was at all events followed by it. That the beginning of the peat-bed occurred when the climate began to ameliorate, as is evident from the presence of the oak, which will not flourish in cold climates. In Norway the extreme limit of growth is said to be 63° latitude. That a vast forest-growth must have been going on for ages to accumulate such a mass of peat; that it occurred when the elevation of the land was far higher than at present; and that what is now the estuary of the Severn was then a dense forest. That afterwards a subsidence of the land set in, which covered up the whole of the forest; that we see probably only a portion of the silt which was left, which, in its turn, was covered with a sprinkling of drift.

Mr. LUCY's paper was followed by one by Mr. G. PLAYNE, describing recent calcareous deposits in the Cotteswolds, illustrated by an interesting series of specimens, shewing the effects of infiltration and incrustation.

After the conclusion of these papers, many of the members went to see portions of the foundations of the old Eastgate of the city, with the adjoining walls, which had been discovered in making excavations in King Street for the printing premises of Mr. John Bellows. In making these cuttings were found several pieces of Roman pottery, the common black, and good red Samian; pieces of brick and tile, a bone needle and some bone hair-pins. So here were three civilizations, one superimposed upon the other in regular stratigraphic sequence, the old Roman being at the base, then the walls of the mediæval city, and lastly the Steam Press of the 19th century, in which are combined all the memories of the past and all the powers of the future.*

The party dined together at the Spread Eagle Hotel. After dinner the President read a long and interesting letter from a gentleman of the name of Twopeny, giving an account, with illustrations of a strange animal, which he and a party of friends on board a yacht had watched for a whole summer's day in the Sound of Sleat, off the island of Ske. The creature was described as lying on the surface of the water—it was calm—in several long lumps or undulations, extending for a distance of 60 or 70 feet. It eventually bore down on the vessel, with a great head of spray, which it was described as throwing up in front, accompanied by considerable disturbance of the water. When within 100 yards it turned off, and its course could be traced below the surface for a considerable distance. This was supposed to be the strange creature which under the name of the "Sea Serpent," has been from time to time chronicled as a visitant to the coast and Fiords of Norway from the days of Pontoppidan, since which time it has been an enigma to science and philosophy. The present instance, though so near apparently to affording a solution, leaves the question as far from settlement as ever.

The first Field Meeting for the season of 1873, was held at

BIRDLIP,

on Wednesday, 14th May, on which occasion a large number of members assembled on the lawn of the Black Horse Inn, a locality rendered interesting to the Cotteswold Naturalists as having been that at which the Club took its origin on the 7th July, 1846.

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* A drawing of the wall is given further on.

The party divided into two sections, Archæological and Geological; the former, under the guidance of Mr. J. D. T. Niblett, proceeding to visit the ancient Church at Elkstone, about three miles distant; while the geologists, under the guidance of Professor Buckman, made their way to the neighbouring quarries, to hear the learned Professor correlate certain beds exposed in that well-known escarpment with those of the same formation in Dorset. The Professor intimated that during the walk he should shew that the Cephalopoda-bed of Dorset, which was regarded by Dr. Wright and other Cotteswold geologists as liassic, and as the equivalent of the Cephalopoda-bed of Gloucestershire, also termed liassic, was really not at the bottom but at the top of the Inferior Oolite. Proceeding in the direction of Crickley hill, the party halted on the slope facing the fine section there exposed, while the Professor developed his views on the correlation of the beds in question. The substance of his remarks was, that the Cephalopoda-bed of Dorset is not the equivalent of the Cotteswold bed, but occupies the position of the Gryphite bed at Leckhampton and elsewhere; that the Inferior Oolite of the Cotteswolds is in Dorset represented by Sand, but that in a bed of about two feet in thickness, nearly all the fossils of the Inferior Oolite of Gloucestershire, including the Ammonites of the Cephalopoda-bed, are found; hence he inferred that the division of the Inferior Oolite of Gloucestershire into zones founded on some of these Ammonites, was a mistake. Dr. Wright, in reply, emphatically denied the presence in the Dorset bed of the liassic Ammonites, *A. opalinus, A. Jurensis*, and *A. striatulus.* The discussion continued during the progress of the party round the base of the quarries, but eventually the Professor and Doctor agreed that the beds were not identical, so that the question of the zones only remained for discussion after the reading of Professor Buckman's paper in the evening.

Mr. Witchell called attention to a bed of oolitic rubble and angular gravel on the slope of the hill, as bearing upon the subject of a paper to be read by him. The party returned over the hill to the Black Horse Inn, where they were joined by the archæologists, and all sat down to an excellent dinner, served in the spacious summer-house attached to the inn.

After dinner, Professor Buckman read his paper, the object of which was to shew that the "Cephalopoda-bed" of Dorset, which had by various authors been considered as the representative of the "Cephalopoda-bed" so well known in Gloucestershire, is really the equivalent of the "*Gryphite Grit*" of Leckhampton, and of the "*Trigonia Grit*" of Lineovers, and hence is at least 100 feet higher in the Oolitic series than was at one time supposed.

It was further contended that the thick mass of sands *beneath* the "Cephalopoda-bed" in Dorset, so far from being Liassic, as authors had contended, for 100 feet at least of their thickness represent the Inferior Oolite beds of the mass of Leckhampton and Crickley Hills, and that if, therefore, the equivalent of the Gloucestershire "Cephalopoda-bed" occurs, as has been stated, at Bradford Abbas and Bridport, it must be *below* this 100 feet of sands, and not at the top of them.

Professor Buckman claimed to have been the first to have noticed these facts, and urged that if he was right, he had good reason for asserting that Oolitic Geology has been incorrectly read over much of the country, both at home and abroad.

Dr. Wright, being called upon by the President, replied in a spirited and eloquent speech to the principal points in Professor Buckman's paper, and took a comprehensive view of the subject under discussion. He adhered to his views in reference to the zones of life, as distinguished by certain Ammonites, and urged that the questions at issue were palæontological, not lithological, and could be settled on no other basis. The subject was not new; his views had been published years ago, and had been discussed and adopted by the ablest geologists in Europe. He declined to follow Professor Buckman into all the details of his paper; the mere enumeration of such long lists of fossils would be a weariness to the flesh, and a punishment he was not disposed to inflict on the members of the Cotteswold Club; but that any one wishing to know how the matter stands, should read his paper in Vol. 16 of the Quarterly Journal for 1860, pp. 34-47, where they would find the Birdlip and Dorset Sections correctly given.

Mr. WITCHELL then read a paper on the angular gravel of the Cotteswolds. After referring to the opinions of former writers on the subject, and quoting from Mr. LUCY'S paper on the gravels, read in 1869, he proceeded to state that the opinions formerly entertained upon the origin of this gravel were greatly modified. He then discussed the opinion held by Mr. LUCY as to the deposit of the gravel, which that gentleman attributed to frozen snow and ice, which on the approach of spring, during a period when we had a colder climate than at present, slipped down the hill sides, carrying with it the detritus of the rocks. Mr. WITCHELL contended that there was no trace of ice action to be found, and referred to a section of a gravel-pit at Longfords, near Nailsworth, in which the angular gravel was interstratified with the river gravel found at the bottom of the valleys, but which could not have been so intercalated if it had been due to the agency of ice. He attributed the deposit of the gravel to the action of rain and surface drainage, but thought that in some instances it was brought down the slopes of the hills upon a surface of frozen snow, which, dissolved by the rains of spring, would facilitate the transport of the gravel to the positions in which it is found. The gravel-beds are very numerous in the Cotteswolds, and are by no means confined to one level. The period of their deposit commenced at the same time as that of the rolled river gravel, as shewn by their interstratification at Longfords; but in a lesser degree the deposit may have continued to Recent times.

THE SECOND FIELD MEETING

took place by invitation of Messrs. COSSHAM and WETHERED, on Wednesday, 18th June. It will be remembered that at the June Meeting in the previous year (1872) the Club had enjoyed the privilege, by the kind invitation of Mr. HANDEL COSSHAM, of inspecting the Kingswood Collieries, and were made acquainted with the physical conditions affecting the coal deposits of that area, more especially with those which govern the upper series of coals and their relations to the great thickness of "Pennant" sandstones, which in that district divide the upper from the lower coal measures. It was then urgently pressed upon the Club that they should at a future meeting complete their survey of the basin by an examination of the ground between Mangotsfield and Bitton, and from thence to Bristol. This object was not lost sight of, and in fixing the programme for the present season, it was arranged that the June Meeting should be devoted to the purpose. Mr. Cossham again, in a spirit of splendid hospitality, undertook all arrangements for the day, which included a visit to the remarkable "fault" at Willsbridge, near Bitton, and a voyage from Keynsham up the Avon to Bristol, with a dinner on board the boat.

The beauty of the day and the attractive features of the programme drew together a large concourse of members and their friends, of whom nearly sixty assembled around the President at Bitton Station.

Willsbridge crosses the line of rail about a quarter of a mile from Bitton Station, and is thrown over a cutting which reveals a very remarkable "fault." At this point the New Red Marls, with the overlying Rhœtic series and the "Ostrea" beds, of the Lower Lias, are "faulted" against the "Pennant" by a "throw" of about 500 feet; the edges of the more recent rocks being thrown up at a high angle against the line of fracture, which is absolutely perpendicular, like a wall. Here the party arranged themselves on either side of the cutting, while sections on a large scale were displayed, by the help of which the audience was enabled to follow the explanations of the geological features of the district, which were most instructively detailed by Mr. Etheridge, F.R.S., of the Geological Survey; by Mr. Charles Moore, Dr. Wright, Mr. McMurtrie and Mr. Handel Cossham. An excellent luncheon having been discussed, provided by the kind forethought of Mr. Cossham, the party proceeded in carriages to Keynsham, where a barge, most commodiously fitted up and covered with an awning, was in readiness to convey the party in tow of a steamer, down the Avon to Bristol. This portion of the day's proceedings was very delightful. The river pursues a winding course, at first through the alluvial flats of Keynsham Hams, which it quits at Hanham Mills, to force its way through a romantic rock-bound gorge, clothed with luxurious woods. From this point all the way to Bristol the scenery is very beautiful. At Crew's Hole the party disembarked, and ascended Trooper's Hill, which commands an extensive prospect, from whence the area of the lower coal-field, stretching under Dundry Hill to the Mendips, can readily be apprehended. Here some interesting legends were related, having reference to a condition of things and society now happily passed away. From this hill the Parliamentary forces looked down upon Bristol; and Crew's Hole, close by, derives its name from having been the rendezvous of sailors fleeing from the press-gang. A white house was pointed out as the scene of many a desperate encounter between the sailors and the agents of the government, in which the latter were by no means always successful. A story, too, was told of a Mayor of Bristol, who in the year 1756 was carried off by a party of miners, and kept prisoner for three days in a coal-pit, until the demands of his lawless captors were complied with.

On the return of the party to the boat, a cold collation, with champagne and all manner of good things, which the hospitality of Mr. Handel Cossham had provided, received ample justice at the hands of the hungry excursionists. The entertainment at an end, toasts and speeches followed, and much pleasant converse; the health of Mr. Handel Cossham and of his partner, Mr. Wethered, was drunk, and the former was unanimously elected an honorary member of the Cotteswold Field Club. Thus steaming pleasantly along through the suburbs of Bristol, the boat was moored at the quay, within three minutes' walk of the railway station, in excellent time to admit of members taking the train to their different destinations; and thus terminated one of the most delightful days ever enjoyed by the Cotteswold Club.

The Third Field Meeting for the season took place on Wednesday, 23rd July, at

WESTON-SUPER-MARE,

with a view to the examination of the geology between that place and Swallow Cliff. The programme embraced a visit to the ancient entrenchment on Worle Hill, the village of Kewstoke, with its Church and fine Norman doorway; the ancient Priory at Wood-spring, and the "raised beach" at Swallow Cliff.

The head-quarters of the Club were fixed at the Royal Hotel, Weston. The point first reached in the day's excursion was the entrenchment on Worle Hill, immediately overhanging the town. This large and important work belongs to those examples of rude fortification which, from the very artlessness of their construction, have been referred to times the most remote. The fortress at Worle Hill resembles in a remarkable degree that at Carn Goch, near Llandilo Vawr, in Caermarthenshire, both in the mode of construction of the vallum, formed of loosely piled stones, and in the remarkable shelter-pits formed in the thickness of the rampart, evidently as a protection for the defenders. The ramparts are strongest at the east end of the enclosure, which was the most easily accessible. At this point three lines of fortification are distinctly traceable, the steep sides of the hill rendering access at other points more difficult. The interior of the fortified space contains a great number of hut circles. These were carefully examined some years ago by a Committee of the Somerset Archæological and Natural History Society, when some human remains and portions of iron implements were discovered. These circles seem to have been formed by making excavations a few feet in depth, the sides of which were built up of loose stones, with a framework of wattle or wicker, probably roofed over with turf. On the side of the camp furthest from Weston, there is a remarkable pass leading down to the village of Kewstoke, consisting of a flight of more than 200 steps, also strongly fortified, and no doubt once extending farther down to the sea than it does at present, thus constituting, in all probability, the principal landing-place for the British Town. The local legend tells that these steps led to the cell of a British or Saxon saint named Kew, and hence they are called "St. Kew's Steps." But "*Kwch*," in Welsh, means a boat, and Stoke means Station; so Kewstoke has nothing to do with a saint, but was the water-gate and landing-place of this early British settlement. When the Romans took possession of the country, the place was probably soon deserted, the population removing to the Roman Axium, now called Uphill, on the other side of the bay.

After a careful examination of this interesting camp, the party descended by St. Kew's Steps directly down upon Kewstoke Church, which was next inspected. This church was restored in 1850, but its fine Norman door-way was preserved intact, and the font and beautifully carved pulpit are well worthy of examination. From this point the route lay through the little hamlet of Norton, where the Lower Lias and Rhœtic beds are exposed, to Culm, where the "Planorbis Zone" is well displayed and very fossiliferous. On reaching Woodspring, all were charmed with the picturesque appearance of the ruins of the Priory, seated under the shelter of Middle Hope Hill, and surrounded by the most luxuriant foliage. The Priory is said to have been founded about 1210 by one of the Courtenays, who was in some way connected with the assassination of Thomas à Beckett. It was endowed and enriched by the descendants of others who were concerned in the same transaction, to the end, as the monkish chronicle has it, "that the daily mass might cleanse their souls and free them from the pains of purgatory." Anyhow, the founders shewed their good taste in the selection of the site for their monastery; for a more beautiful spot, even in that rich and beautiful country, could not have been chosen whereon to build their nest. But of the buildings raised here, little now remains, and those portions left are rapidly falling into still greater decay.

The fine central tower of the church is still in good preservation; it is of beautiful late "Decorated" architecture, having fan-tracery in the vault of the lower portion of the belfry; the parapet is pierced in quatre-foils, with open panel-work in the window; the chancel is destroyed. On the stone imposts of what was once a principal arched entry, are corbels of angels supporting escutcheons, one of which bears the emblems of the Passion, the other, a "Chevron between three Bugle-horns stringed," being probably the armorial bearings of a prior or benefactor of the monastery. The work of destruction amongst these venerable and interesting relics has been carried on till within a comparatively recent period. So lately as five years ago portions of the monastic buildings were removed, when, we were informed, there was found enclosed in the solid masonry of one of the walls,

. . . . "the bones
Whitening amid disjointed stones,"

of some victim of priestly cruelty and superstition.

From Kingswood the party ascended Middle Hope Hill, and walked along the ridge to Swallow Cliff, greatly enjoying the fine fresh breeze and the noble view, which includes the coast line on both sides of the channel, from Portishead to the high land above Ilfracombe. The "raised beach" was soon found by the aid of some excellent sections supplied by Mr. ETHERIDGE, and drawn on an enlarged scale by Mr. EDWARD WETHERED. The hill of Middle Hope and Swallow Cliff consists of Carboniferous Limestone. It is evident that an elevation of the coast to the extent of 30 or 40 feet has taken place within a comparatively recent period. This action is traceable again at the west end of Worle Hill, where a similar "raised beach" is exposed. The shells, which are of the ordinary littorine type, occur beneath the turf and at its edges in considerable abundance. Through the beds of limestone beneath the "raised beach," protrusive and interbedded trap occurs in huge masses, thrust out of the shingle. This trap dyke is again seen in connexion with the "raised beach" at the west end of Worle Hill, and is probably a continuation of the same which at Uphill causes the remarkable "fault," so well displayed in the cutting on the Bristol and Exeter line of railway.

After some time spent in the examination of this most interesting spot, the party walked back to the Priory, and returned through the village of Worle to Weston, carrying with them a considerable quantity of "edible fungi," which formed an addition to the excellent dinner awaiting them at the Royal Hotel.

I regret to state that this was the last meeting of the season. The Club had fixed upon Tuesday, 9th of September, for a fourth meeting, which was appointed to take place at Bromsgrove Lickey, with the object of examining the Northern Drift, Conglomerate beds of the New Red, Permian breccias, Coal Measures, Upper Llandovery and Lickey Quartz, and other interesting features of the district. Arrangements had likewise been entered into with the Railway authorities to set the party down, in case a sufficient number declared to go, at Blackwell Station, which would have been more convenient than at Bromsgrove; but as the names of only seven members were sent in to the Secretary, it was thought advisable to postpone the visit to the Lickey to a future day, when the enthusiasm of the Club might be greater. It was, perhaps, injudicious to fix a meeting so late as the month of September, but as this was done with the approbation of a large meeting of members, and our opportunities of coming together are so few, it is a matter for regret that a larger number should not have volunteered to join in what could not have been other than an interesting and instructive excursion.

In concluding this address, it only remains for me, gentlemen, while thanking you for your confidence in me as your President, now renewed for so many years, to express the sincere satisfaction I have experienced in witnessing the continued prosperity of our association; and to assure you that so long as you honour me with your confidence, I will do all that in me lies to advance the objects we have most at heart, and to promote the interest, the well-being, and the good fellowship of the Cotteswold Field Club.

The Submerged Forest, Holly Hazle, Sharpness. By W. C. LUCY, F.G.S., F.A.S.L. *Read at Gloucester, March* 6, 1873.

In the paper on "the Gravels of the Severn, Avon, and Evenlode, and their extension over the Cotteswold Hills," which I read before the Club in April, 1869, I referred briefly to the evidence in the estuary of the Severn of the occurrence of Peat Beds, more particularly at the Royal Drough near to Sharpness Point. Since then, in forming the new Docks at Holly Hazle, a continuation of this bed has been cut through, shewing a well exposed section, and I now propose to give the result of the observations made during the progress of the work.

As the subject of Peat Beds and submerged forests generally is new to the members of the Club, I have thought it best, in order to enable them to form a clearer opinion upon it, to enter somewhat fully into the details at present in my possession.

They occur mostly at the mouths of rivers, and are to be seen at low water mark, more particularly after storms, when the action of the water, from high winds or land-floods, removes the silt which often covers them up. Indeed the whole of the coast line of Great Britain is more or less fringed with submerged forests, and they have been observed along the coast of Northern France, at the mouth of the Somme, at Sangatte, and Wissant, near Calais, and they also occur very extensively on the coast of Holland, extending far into the interior of that country.

In England that of Cromer, on the Norfolk coast, is perhaps the best known. I have taken a section of it from Sir Charles Lyell's "Antiquity of Man." [*See plate.*]

This bed occurs overlying the Chillesford beds, and Sir Charles observes, "This buried forest has been traced for more than forty miles, being exposed at certain seasons and states of the beach between high-water and low-water mark. It extends from Cromer to near Kessingland, and consists of the stumps of numerous trees standing erect, with their roots attached to them, and penetrating in all directions into the loam or ancient vegetable soil on which they grew. They mark the site of a forest which existed there for a long time, since besides the erect trunks of trees, some of them two and three feet in diameter, there is a vast accumulation of vegetable matter in the immediate overlying clays. Next, above No. 2, we find a series of sands and clays with lignite (No. 3), sometimes ten feet thick, and containing alternations of fluviatile and marine strata, implying that the old forest land which may at first have been considerably elevated above the level of the sea, had sunk down so as to be occasionally overflowed by a river, and at other times by the salt waters of an estuary. There were probably several oscillations of level which assisted in bringing about these changes, during which trees were often uprooted and laid prostrate, giving rise to layers of lignite. Occasionally marshes were formed, and peaty matter accumulated, after which salt water again predominated, so that species of *Mytilus*, *Mya*, *Leda*, and other marine genera, lived in the same area where the *Unio*, *Cyclas*, and *Paludina* had flourished for a time. That the marine shells lived and died on the spot and were not thrown up by the waves during a storm is proved, as Mr. King has remarked, by the fact that at West Runton, N.W. of Cromer, the *Mya truncata* and *Leda myalis* are found with both valves united and erect in the loam, all with their posterior or siphuncular extremities uppermost. This attitude affords as good evidence to the Conchologist that those mollusca lived and died on the spot as the upright position of the trees proves to the Botanist that there was a forest over the chalk east of Cromer.

"Between the stumps of the buried forest, and in the lignite above them, are many well-preserved cones of the Scotch and Spruce firs, *Pinus sylvestris*, and *Pinus abies*, some of the cones of the spruce having only the central part or axis remaining, the rest having been bitten off, precisely in the same manner as when in our woods the Squirrel has been feeding on the seeds.

"The following is a list of some of the plants collected from the forest bed:—

Pinus sylvestris, Scotch fir
Abies excelsa, Spruce fir
Nuphar lutea, Yellow water-lily
Ceratophyllum demersum, Horn wort

Taxus baccata, Yew
Prunus spinosa, Common sloe
Menyanthes trifoliata, Buck bean
Nymphœa alba, Water-lily
Potamogeton, Pondweed
Alnus, Alder
Quercus, Oak."

To these Mr. Gunn adds rhizomes and fronds of ferns.

The record of mammalian remains is from Mr. Prestwich's "On Crag Beds of Suffolk and Norfolk:"*

Elephas antiquus
" " var. *priscus*
" *meridionalis*
Rhinoceros megarhinus
" *etruscus*
Hippopotamus major
Equus (caballus), the common horse
Machairodus? A tiger
Bison Priscus?
Bos (primigenius)
Sus (arvernensis)
Ursus arvernensis
" *spelœus?* Cave bear
" *etruscus?*
Cervus megaceros
" *elaphus,* Red deer
" *Sedgwickii*
" *poligniacus*
" *capreolus,* Roe-deer
" *arduens*
Trogontherium Cuvieri, A great beaver
Mygale moschata, Musk shrew
Sorex fodiens, Shrew
" *remifer,* "
Arvicola amphibia, Field mouse
Castor Europœus, Common beaver
Two species of whale
Vertebræ of fish

Mr. Boyd Dawkins is of opinion that *Cervus Elaphus, C. megaceros,* and *C. capreolus* are not to be regarded as the Pliocene age, while *poligniacus* is a well-known Pliocene species; and this peculiar mixture of cervine species indicates that the forest bed belongs rather to an early stage of the Pleistocene than to the Pliocene; and this inference is corroborated by the presence of the Mammoth which is so characteristic of the Pleistocene age.†

From the occurrence of such varied and large mammalia, most of them of extinct species, Prof. Ramsay thinks they could not have originated in a small detached island like England, but formed parts of large families that inhabited the north of Europe, America, and Asia, at various minor periods of geological time, and they could only have passed into our area by the union of England with the continent.§

In the last edition of the "Principles of Geology," (vol. 1, ch. x,) attention is drawn to the singular analogy existing between the forest bed of Dürnten, near Zurich, and that of Cromer, just described.—

Both contain the cones of the Spruce and Scotch fir, and the seeds and leaves of marsh plants, and some shells and mammalia. Each was preceded and followed by a period of greater cold. The antecedence of a colder climate is proved by the arctic character of a large proportion of the shells of living species, included in the marine strata of Chillesford, near Ipswich, and that the forest bed of Cromer was followed by an era of severe cold, is shewn by the fact that it underlies the great mass of glacial drift, in part unstratified, and containing boulders and angular blocks transported from great distances, and some of them exhibiting polished and striated surfaces. With regard to the Dürnten bed, we have abundant evidence of two glacial periods in the Alps, during the first of which the glaciers attained colossal dimensions. After these had retreated for a time, they advanced again, but on a smaller scale, though still vastly exceeding in size the largest Swiss glacier, of our day. The interval of milder weather, marked by the decrease of snow and ice in the Alps, has been called by Prof. HEER the Inter-Glacial Period, which must have been of considerable duration, for it gave time for the accumulation of dense beds of lignite, like those at Dürnten and other localities near Zurich. During this intercalated series of warm seasons, the climate is supposed by HEER to have closely resembled that now experienced in Switzerland. He infers this from the fossil flora of the lignite, especially from the cones of the Scotch and Spruce firs, and the leaves of the ash and yew—all of living species—as well as from the seeds of certain marsh plants.

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* Quarterly Journal, Geo. Soc., vol. xxvii., p. 466.

† Quarterly Journal, Geo. Soc., vol. xxviii., p. 410.

§ Physical Geology and Geography of Great Britain, 3rd edition, p 179.

Sir CHARLES LYELL further says:—

We are by no means sufficiently advanced in our interpretations of the monuments of the Glacial Epoch, and of the long succession of events which mark its history, to be able to affirm that the Inter-glacial periods of Dürnten and Cromer, above mentioned, were contemporaneous, but they both of them alike demonstrate that there were oscillations of temperature in the course of that long epoch of cold.

In Messrs. WOOD and ROMES' valuable paper in the Quarterly Journal for May, 1858, on the Glacial and Post-glacial Structure of Lincolnshire and South-east Yorkshire, there is an account of a forest bed at Hull, and Grimsby, and of which I have given the section of the beds at the Hull Docks. They remark:— "At Hull the dock borings showed this forest to be now from 20 to 37 feet below high water mark of ordinary spring tides, the whole of that depth being occupied by the silt with mollusca and salt water. The borings for the Grimsby Docks disclosed the same forest bed at still greater depths, varying from 35 to 52 feet below high water of ordinary spring tides, and everywhere covered with silt and salt water. From the Grimsby borings (which were more than 100 in number, and principally carried to depths of from 70 to 80, but in some to upwards of 100 feet below high water) regular sections were constructed by the dock engineers. In some places there were two forest-surfaces divided by a bed of leafy clay from 5 to 15 feet thick. We have also reason to believe that evidences of this recent easterly depression of a late, Post-glacial forest-surface, varied by some slight oscillations, obtain further south over the area of the great fen country. Unless we suppose the forest at Grimsby to have grown down to the very level of high water, we must allow an even greater depression than the 52 feet of the Grimsby borings; and it will, we think, occur to all how material an alteration, and in some parts reversal, of the earlier lines of Post-glacial drainage such a depression must involve, if it were not equal over the area."

Mr. Godwin-Austen's description of the Porlock beds which occur low down the Bristol Channel, in Somersetshire, is so clear that I quote largely from it, and have constructed a section from the information he has given.*

I. He observes that "it has been long known that there was a submerged forest beneath Porlock Bay," and, taking the strata in descending order, speaks first of the shingle beach, which "is composed wholly of the siliceous rocks of the coast from Porlock westward, and forms a ridge round the bay."

II. Passing to the Marine Silt, this is described as "of a yellowish-brown colour, containing the shells of *Scrobicularia piperata*, with the valves united, and of all ages. The presence of these shells shews that the lower part of the Porlock Valley was at one time in the condition of a mud-flat, wholly covered by the sea at every tide, perhaps even permanently covered."

III. The surface of plant growths next claims attention and the following account is given :—

"At low water and when the coast has been swept clean of shingle, there is presented an expanse of mud-deposits, with the stumps of trees studded about. The mud-deposits occur in patches, owing to the action of the breakers which cut out portions; around these patches are good sections. The uppermost mud-deposit, that with the *Scrobiculariæ*, is not very resisting, so that it occurs only occasionally over the area left by the tide; enough, however, remains to show that it was at one time spread out continuously with a like composition and under the same conditions as are presented by the beds beneath the meadows; as such it passes down beneath the present lowest water level. Under the yellow mud-deposit is a dark band, and when the mud has been removed, the surface presents a layer of matted vegetable matter, seemingly composed of roots. This seam is in places several inches thick; on the under side roots descend into the subjacent clay, showing that it has been an old surface of plant-growths. The stools of trees project slightly above the level of this old land surface, and *upon* it lie the trunks of trees. In every instance examined, the surface of plant-growths was interposed between the prostrate trunks and the underlying blue clay. The roots and long leaves seemed to belong to an Iris such as the common 'yellow flag.'"

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* Quarterly Journal, Geological Society, xxii., p. 3.

The above is characterised as "Area depressed below sea level."

IV. The blue mud-deposit occuring next "is a very tenacious mass, resisting the action of the sea. From the abundance of diffused vegetable matter it has the appearance of being of fresh-water origin. It might seem at first sight, as indeed it did to Sir H. De la Beche, that the trees of the submerged forest had grown in this blue mud, from the manner in which they stand out of it; but the mud-deposit *surrounds* the stools of the trees, which never send roots into it; and wherever the mud has been removed, the trees are seen to be rooted in the beds beneath. The accumulation of the mud has been subsequent to the forest growth. The uniform level at which the trees have been cut off may, perhaps, indicate the level of the water which deposited the blue mud, and killed the trees at the same time." Here, then, we have "accumulation of fresh water mud, resulting probably from a depression of the level of the land."

V. With regard to the submerged forest, we find that "the interval left bare by the tide may, under favourable circumstances, be seen studded thickly with the stools of large trees—some bare, some covered by a thick growth of sea-weed, some just projecting above the mud beds. Some are of large size—one measured two feet in diameter. The largest trees were the oaks, which may be distinguished by the black colour of the wood; others when split open are red, probably alders; from their dimensions both must have grown under favourable conditions. The prostrate trunks lay generally N.W., S.E., or away from the opening of the valley; they had been broken off without tearing up their roots." The above is named "forest-growths, established on detrital beds—trees of great age."

VI. "*Angular detritus.*—The flooring upon which the blue mud-deposit lies, for as far out as can be traced, is of coarse angular rocks, instead of some form or other of water-worn materials, as might have been expected; these consisted only of fragments of the splintery quartzose rocks of Dunkerry, of all sizes, with their edges and points as sharp, their surfaces as clean as if just broken, all thrown together in the greatest confusion. Part of this rugged appearance may have been produced by the tides having washed away some of the finer materials. All the trees are rooted in this detritus; it was the surface on which they grew, and had established themselves antecedently to the changes here noticed. The nature of this accumulation, if the explanation be right, renders the Porlock Bay forest-beds of more Geological interest than the more extensive tracts of Bridgewater or Swansea." In the above we have "the formation of angular detritus and its accumulation at lower levels."

"The succession of changes here indicated corresponds with that of numerous other localities in the West of England. The Porlock example in addition seems to fix a relative date for a part, namely, as being subsequent to the great subaërial weathering of the surface during the Glacial Period. The elevation of the land was greater at that time than at present, but by how much we have no means of determining."

"The difference of level within which the land has oscillated since then need not be estimated at more than 40 feet, the range between high and low water on the Bristol Channel coast being taken at 33 feet. It is certain that such forest-growths as pass on all sides *beneath* the line of low-water, could not have lived at the high-water level, but a rise of 50 feet would convert the upper part of the Bristol Channel into land-surface. The greatest depth at which submerged land-surface has been ascertained, is about 120 feet; a rise of such amount would place the whole of the Bristol Channel in the condition of dry land, and such probably it was at the time of the forest-growths."*

The Peat Bed near Sharpness lies in a hollow, very much resembling a trough, excavated out of the lower beds of the Old Red Marl. The silt covering the bed is cut through by Holly Hazel brook a short distance before it reaches the river. This brook is a small stream, rising in the Ludlow rocks, about two miles distant.

By reference to the maps, carefully prepared for me by Mr. ERNEST BALDWIN, the son of the Contractor in charge of the Works, to whom I am also indebted for much information, it will be seen that the peat attains a maximum thickness of nearly 14 feet, and, as it rises near the surface, thins out to a few inches. It is composed mainly of Oak, Alder, Beech, and Hazel, and, towards the top of it, some nuts of the latter were found quite perfect.

The trees generally were observed to lie North and South, and, at the point where the peat was the deepest, they occurred most abundantly about six feet from the bottom. The wood forming the peat of the underlying portion was much decomposed, with some fine sand in it.

Some of the Oaks were of considerable size, indeed one was quite a Giant of the Forest, measuring as it lay, 80 feet; and 2 ft. 9 in. in diameter at the top. The base was a good deal decayed, and, as far as could be ascertained, exceeded 5 feet in diameter. The bark, a few feet from the butt, was in places almost entire; and the part now in the Gloucester

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* I have lately visited Porlock, and although some changes have taken place from the great encroachment of the sea since Mr. GODWIN-AUSTEN'S paper was written, his description is still practically correct, but I would observe that now the greater part of the forest trees are in the blue mud, and those in the shingle are mostly hazel and at the extreme west point. From digging I ascertained that the mud which is extremely tough and tenacious thickens towards the east, where it is fully 3½ feet thick. It extends far into the sea, forming an excellent anchorage ground for vessels, and has the appearance of having been formed by the action of ice, and seems to be derived from the lower lias clay which occurs in the district.

Museum was cut about 24 feet from the base, and shews a diameter of 3 feet.

The tree was found at the point marked "b" on the map, lying in a slanting position, the butt being on the edge of the peat 9 ft. from the surface of the ground, and the small end 5 ft. 6 in. in the peat, therefore the latter was buried to a depth of 14 ft. 6 in.

Although a diligent search was made whilst the works were in progress, it was two years before any shells were discovered. They were few in number and occurred in the silt in a kind of nest or pocket, from 4 to 6 feet below the surface, (marked on map E.,) and which it will be seen is close to the Severn. On examination they were found to be *Tellina solidula*, a shell which occurs in the lower part of the Severn at the present day. Where the peat was the thickest, and within about two feet of the bottom of it, were found a fine head of *Cervus Elaphus*, antlers and jaw bones of rather a small deer, head of horse, and *Bos longifrons*, skull of a dog, and tusk of the boar.

On showing Prof. Church, of Cirencester, the head of *Cervus Elaphus*, he pointed out to me what had escaped my observation, that the antlers had been cut off apparently by some rude implement.

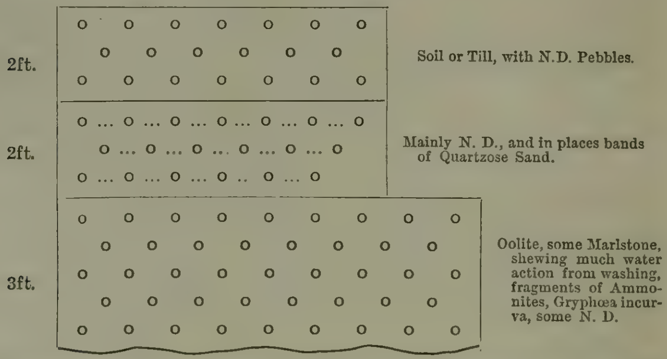
The bottom of the peat was about the height of mean low-water mark in the Severn, and the difference between that and the highest spring tides, and the greatest point to which the water recedes, represents about 35 feet below high-water.

About 8 feet of fine silt, with some clay in it, covered up the peat, which reposed upon a fine clay, varying from a few inches to four feet in thickness, and so reduced apparently by attrition as to be fit for Potter's work. In it were Northern Drift pebbles, some small boulders, and a little flint. The clay rested on an eroded surface of the Old Red Marl, from which formation it was evidently derived; but in places the marl rock below was partly decomposed from, as I believe, the draining of water out of the superincumbent clay. Where the clay was thinnest the pebbles assumed the form of a thin band; and a few Northern Drift pebbles occurred in the peat as well as in the silt above.

Where the peat thins out, potholes were seen of fine sand and gravel, filled with Northern Drift.

On the present surface of the ground, almost due north of the peat bed, Northern Drift pebbles are scattered with unrolled cretaceous flints, and in some places, as at the bank of the river, the drift is 4 ft. 6 in. thick, resting also on an eroded surface of Old Red Marl, and therefore contemporaneous with the base upon which the clay at bottom of the Peat Bed rested.

S. and S.W. gravel beds were exposed, of which the following is a general section:—


2ft.
Soil or Till, with N.D. Pebbles.
2ft.
Mainly N. D., and in places bands of Quartzose Sand.
3ft.
Oolite, some Marlstone, shewing much water action from washing, fragments of Ammonites, Gryphœa incurva, some N. D.

This gravel bed is nearer the Cotteswold range than the drift due N., which explains the presence of oolite. On either side of the Royal Drough,* at a depth of about 16 feet, is a continuation of the same peat bed about 6 feet thick, and it is met with again a few miles higher up the Severn, at Epney and Framilode; it has also been traced at various places up to Gloucester, and when the Over Bridge there was being constructed, the engineer made careful borings and found 2 feet of peat, covered up by 13 ft. 9 in. of light blue clay, and above that 10 ft. 8 in. of sand and red clay, capped by a foot of soil.

The Holly Hazle bed, as will be seen on the map, extends into the Severn, and I have traced it for 100 yards from the bank; a like peat bed is met with at Lydney, about two miles lower down on the opposite side of the river, and in sinking for a well for the Severn and Wye Railway, a section was made by Mr. G. KEELING, the engineer, to whom I am indebted for it. [*See plan.*]

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* This bed was first noticed by Mr. JOHN JONES in his admirable paper "On Natural History, Geology, &c., of Sharpness Point District," published in our Proceedings vol. 3.

I have in my possession the head with horns attached of a remarkably fine *Bos primigenius* which was found about 16 years ago in the bed of the Severn, between Holly Hazle and Lydney, by a man named Hart, when digging for sand out of the river in a new channel, and which is now however covered by 20 to 30 feet of sand. These horns were found lying on a hard marl rock, but doubtless came out of the forest. Peat has been found at Berkeley Pill, and it also occurs at Awre, which is on the west side of the Severn, and higher up the river.

There are other Peat Beds in the valleys, but they are probably of more recent origin, some most likely since the Roman occupation of this country: they occur nearer the surface, and are covered by detrital matter from the hills adjacent.

It will, I think, be seen in comparing the various Peat Beds, that the position and peculiar mammalian remains of Cromer would indicate it to be of greater age than those of Hull, Grimsby, Porlock, and Holly Hazle; and that the points of resemblance between Holly Hazle and Porlock are more marked, as might be expected from their occurring in the Bristol Channel estuary. The principal difference is in the upper bed of silt above the forest bed. At Porlock there has clearly been a deposit of sea-mud, proved from the presence of *Scrobicularia*, which is absent at Holly Hazle, but occurs at Hull and Grimsby. The silt at Holly Hazle is most likely nearly all of fresh water origin, probably brought down by land floods. Again at Porlock there are no remains of the fine clay beneath the peat, which has for its base a thick bed of angular detritus, while at Holly Hazle it is only a thin band.*

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* As Mr. GODWIN-AUSTEN remarks the finer particles may have been washed away, and from the examination I made of the angular detritus of like character, but not in the same position, which attains many feet in

To assign the Geological age to the bed at Holly Hazle is by no means an easy task, but I would submit for the consideration of the members of the Club the following facts and the hypothesis I base thereon.

I have stated that at the bottom of the peat is a bed of fine clay, and that this rests on an eroded surface of hard Red Marl. Now, at the base of the drift gravel and close to it at the section already given, the same eroded surface of hard Red Marl is met with.

As the gravels resting on the eroded surface, and which extend up to and around Gloucester, where I have lately seen many admirable examples of the power which must have been required to plane off the hard beds of the Lower Lias, are the low level beds of Mr. PRESTWICH, there is a basis for guidance, but then the question arises, What is the fine tenacious clay which forms the base of the peat bed? and What was its origin?

Now I believe this clay, with its Northern Drift and boulders, only represents a small portion of what once covered, and perhaps filled up, some of our low valleys, and, as I hope shortly to show, extended over the Cotteswolds; and the reason why we have so few traces of Boulder Clay left in the Severn district is that the configuration of the Bristol Channel has always been, (as is the case at present,) such as to give a larger tidal action than the Thames and other of our estuarine rivers, and it is this increased tidal action that has removed so much of the clay.

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thickness on the land above the beach, this must have been the case. The trees, in fact, could not have grown in the angular detritus without some soil being with it.

In the Journal of the Ethnological Society for 1870, page 142, Mr. BOYD DAWKINS mentions that in the autumn of 1869, he and the Rev. H. H. WINWOOD, on digging through a layer of undisturbed vegetable matter, found flint and chert chippings and one very well formed flake, which, apparently, had never been used. They were embedded in the upper ferruginous portion of the angular detritus, and evidently had been dropped upon the surface soil of the period and not transported by water. They also found flint chippings in the same position in the submerged forest at Minehead.

Mr. GODWIN-AUSTEN believes the angular detritus to be referable to the glacial period.

The knowledge that we at present possess as to the rate of the formation of peat is but imperfect. Much depends upon the conditions under which it is formed, and in the present instance we are without definite evidence to guide us. There cannot, however, be much doubt that a long period would be required to form 14 feet—for a large tree to grow on the edge of it to the size I have mentioned—and further, that the slow accumulation of 8 feet of silt, which shews no trace of having been brought *by violent water action*, would be considerable, and afterwards we must not lose sight of the silt itself being in places slightly covered by soil and gravel.

In further confirmation of its antiquity, I would particularly call attention to the section which shews that long since the bed was formed the drainage of the country must have been changed, as is evidenced by Holly Hazle brook. Until the excavations had made considerable progress, I thought the peat bed was supplied with moisture by Holly Hazle brook, such, however, was clearly not the case, as the little rivulet cuts the silt bed above it at right angles, and does not reach the peat itself.

A recent distinguished French writer, M. BELGRAND, in his work* "La Seine" says, "The Quaternary period of the Seine basin is coeval with the Glacial period," and he considers that it was brought suddenly to a close with the low level gravels. To this Quaternary period the peat deposits immediately succeed, owing to the suddenly diminished rainfall leaving the rivers clearer and under conditions favourable for the growth of peat, which, he shews, never takes place in river valleys subject to frequent and heavy floods, but always in valleys where springs abound and the floods are few and not turbulent.

Sir CHARLES LYELL states, "That if all the littoral sunk forests of the South and West of England are referable to about the same Geological period, the occasional presence in them of the Mammoth will entitle them to be regarded as very ancient, or of a date intervening between the era of the lake dwellings and that of the oldest epoch to which man has yet been traced back."

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* "Nature," March 14th, 1872.

The position which I seek to establish is that there was a time when the whole of the land in this part of the Severn valley, as seen in the hard bed of the Old Red Marl at Holly Hazle, and also in the hard Lias beds at Gloucester and beyond Tewkesbury was eroded, and this, I believe, was either caused by the force which deposited the Boulder Clay, or by some kind of ice action just prior to its deposit. That there are remains of that same clay with its embedded small boulders and Northern Drift now at the base of the Peat Bed. That the beginning of the Peat Bed occurred when the climate began to ameliorate is evident, as it is well known the Oak will not flourish in cold climates. In Norway the extreme limit of growth is said to be 63° latitude. That a vast forest growth must have been going on for ages to accumulate such a mass of peat, that it occurred when the elevation of the land was far higher than at present, and what is now the estuary of the Severn was a dense forest, with probably only a narrow rivulet running through it, admitting of the passing over of some of the extinct quadrupeds that inhabited the fissures and caves found in Glamorganshire and Monmouthshire, and that part of the German Ocean may have been at that time forest land also, connecting Great Britain with the Continent.* The fine horns I have referred to of *Bos Primigenius*—an animal that lived in the forest beds of Cromer—came out of the same peat bed between Sharpness and Purton.

That afterwards a subsidence of the land set in which covered the whole of the forest, and most likely we only see part of the silt that is left, and which in its turn was scattered over in places with a slight covering of drift.

The more I consider the recent changes of the Earth's surface the more impressed I am how much we have still to learn, and how important is the investigation of them to enable Geologists more clearly to apprehend the long interval of time which must have been necessary to form the great sedimentary deposits with which our globe is encrusted.

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* See Appendix: Mr. GEIKIE, "The Great Ice Age."

List of some of the places in England and Wales where submerged forests occur on the coast:

Porlock
Minehead
Weston-Super-Mare
Lydney
Sharpness
* *Cromer*
I. *Dagenham, Thames*
II. *Bracklesham, Sussex*
III. *Lyme Regis*
III. *Torbay*
III. *Millendreth Bay, near the Looes*
III. *Mainporth, between Mawnan and Falmouth*
III. *Porthleven, near Helston*
III. *Mount's Bay*
III. *Hayle*
III. *Perran Porth*
III. *Barnstaple*
III. *Bideford Bay*
* *St. Bride's Bay, Pembrokeshire*
* *North Cardiganshire*
* *Denbighshire*
* *Holyhead*
IV. *Between mouth of the Dee and Mersey*
V. *Hunstanton and Holme*
VI. *Westward Ho*

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* Sir Charles Lyell's Principles, vol. 1, page 545.

I. Geologist's Association.

II. Mr. Boyd Dawkins—Quarterly Journal, Geo. Soc., xxvii., page 416.

III. Sir H. De la Beche—Geological Report on Cornwall, Devon, and West Somerset, 417-18-19.

IV. Jukes' Manual of Geology, page 740.

V. Description of the Submarine Forest of Hunstanton, by the late Rev. George Munford, Vicar of East Winch. [See Appendix.]

VI. Exeter Museum. [See Appendix.]

APPENDIX.

Mr. James Geikie, *in his very interesting work "The Great Ice Age" Chap.* xxiii, *gives a full account of Peat Mosses and submerged Forests, from which the following extracts are made.*

One of the most noteworthy points in connection with the peat-mosses remains to be mentioned. They are frequently found to pass below the level of the sea. This peculiarity has been observed in many places all round the coasts. It is needless to describe these submerged forests in detail, but I may note a few localities where they have been seen. On the coast of the Bay of Skaill (Orkney) an acre of peat moss, containing roots and trunks of fir trees, was exposed during a storm by the washing away of the superincumbent sand. Again, on the north side of the Island of Sanday (one of the Orkneys) decayed roots of trees are seen at ebb tide upon the beach at Otterwick Bay, and the like occurs in the bay of Sandwick, another of the same group of islands.

In the sea at Lybster, and under the sands of Riess in Caithness, my colleague, Mr. B. N. Peach, tells me he has seen sunk peat with large trees.

A number of years ago, while some improvements were being made in the Harbour of Aberdeen, a good many trunks of Oak of large size were dug up, and their position showed that they had not been brought down by the river, but had grown where they were found. In the parish of Belhelvie, in the same county, peat moss occurs under the sea-level, and is covered to a depth of 10 or 12 feet with sand. Oak-remains appear in this peat, and from the fact that during storms large cubical blocks of peat are often cast on shore, it seems probable that the peat moss and its buried forest extend for some distance out into the Bay.

In the Carse of Gowrie it is well known that trunks of oak, willow, fir, hazel, and other trees lie buried at depths varying from 20 to 27 and even 40 feet. All these are really at or below the sea-level, for the surface of the carse does not rise more than 20 to 30 feet above that datum line.

In the Islands of the Hebrides the same phenomena may be studied. At Pabbay, for example, moss with large trees is exposed at ebb of the spring tides, and on the coasts of Harris, where-ever a high bank has been undermined and cut back by the sea, a rich loam or black moss is discovered, and this is by no means peculiar to Harris, but characterises all the low lying sandy shores of the Long Island, as in North Uist and Vallay, at both of which places submarine peat and trees occur. Again, on the north-west coast of Tiree, and here and there in Coll, the same appearances recur.

Nor are similar phenomena wanting along the western shores of the mainland, for trees and peat have been found under low-water mark at Loch Alsh; while at Oban the bottom of the harbour, which is not less than twenty fathoms deep, is said to be covered with peat in some places.

Now these facts enable us to conclude that the sea has within geologically recent times made considerable encroachments upon the land. It is quite clear that our shores and the opposite coasts of the continent have at some period in the past extended much farther seaward. We infer this not only from the facts connected with the submerged mosses, but also from the large size of the buried trees of the maritime districts. In most of the Islands it is impossible for trees now to attain to respectable dimensions, unless they are carefully protected and looked after. When the buried forests of the Hebrides and Orkney and Shetland Islands were growing, no doubt the land stood at a relatively higher level and the sea at a greater distance.

But more than all this, peat has been dredged far out in the German Ocean and the English Channel; and fresh water and littoral shells have been dredged in deep water at distances of fourteen and forty miles from the nearest land. Add to these cases, the frequent occurrence of mammalian remains, bones and tusks of the Mammoth, which have been obtained often at a considerable distance from the English coast, both in the North Sea and the English Channel, and we shall hardly escape from agreeing with Mr. Godwin-Austen, who infers that at no distant date, geologically speaking, the bed of the North Sea was a great undulating plain traversed from south to north by a mighty river, which carried the tribute of the Thames, the Rhine and other streams, and poured in one magnificent flood into the Northern Ocean.

The character of the buried timber indicates pretty clearly the kind of climate experienced at that time in Britain. It is impossible to look at the thick bark and the tough resinous wood of the bog-pines, without feeling sure that the winters then were much colder than they are now. A rigorous climate is required to produce the best pine-wood, and it has been frequently observed in the north of Scotland, that trees grown in the most exposed situations show the reddest wood and the thickest bark. Yet pines dug out of mosses in the south of England compare favourably with the best timber in the old pine forests of Rothiemurchus. This of itself is enough to show that our climate has greatly changed within comparatively recent times.

But again, the presence of large oaks buried in peat, at heights and in situations that would now be considered most unfavourable to their growth, bespeaks the former prevalence of somewhat warmer summers. In short, we are led to conclude that the seasons during the growth of the ancient forests, were more strongly contrasted than they are now. Such conditions would naturally follow upon the union of Britain with the Continent. With broad wooded plains substituted for the German Ocean and the Irish Sea, and with a wider spread of land along our western sea-board, it can hardly be doubted that, other things being equal, our climate would be greatly affected, so much so as to *approach in character* to that of Germany.

Forest Bed in the Thames.—The following account of a visit of the Geologists' Association is taken from the *Times* of July 8th, 1873, describing a forest bed in the Thames. "It is not generally known that both at Plumstead and Dagenham, and in other parts of the Thames between Woolwich and Erith, there are visible, at low water, the remains of a submerged forest, over which the river now flows, suggesting curious questions as to the former physical geography of the country. The Phenomenon was first described by Captain Perry about 150 years since, in the interesting narrative he has left of his repairs of Dagenham Breach. . . . Overlaid by some six or eight feet of marsh alluvium was seen a large bed, full of twigs, leaves, seed-vessels, and stools of trees, the species of which were determined by the botanists to be chiefly yew, alder, and oak. A collection of animal remains, consisting of antlers of red deer, jaws of the long-fronted ox, and other recent species, were obtained from the same forest bed during the excavations for the southern outfall sewer in 1862-3."

Description of the Submarine Forest of Hunstanton, by the late Rev. George Munford, *Vicar of East Winch.*—"A very striking instance of the destruction of land on the borders of the ocean, by the mighty agency of tides and currents, or by some other natural causes, may be seen off the coast of Hunstanton and Holme at low neaps. For there commences at Brancaster Bay, stretching by Holme and Hunstanton, across the Wash, and extending all along the coast of Lincolnshire, from Skegness to

Grimsby, a submarine Forest, which, in ages far remote, abounded in trees and plants indigenous to the district. This now submerged tract was once inhabited by herds of deer and oxen, as is evident from the remains of their horns and bones which have been occasionally found there; the foot of man has also trodden these now ruined wastes, for works of art have been met with, buried with the forest beneath the waves.

"It is difficult to reach this overwhelmed forest from Hunstanton without the assistance of a boat; but in the autumn of 1831, accompanied by a friend, the writer managed to visit it on foot.

"About two miles north of the cliff, and a mile and a-half from high water mark, we arrive at the prostrate forest, consisting of numberless large timber trees, trunks, and branches, many of them decomposed, and so soft that they might easily be penetrated by a spade. These vegetable remains are now occupied by an immense colony of living pholades and other molluscs, and lie in a black mass of vegetable matter, which seems to be composed of smaller branches, leaves, and plants of under growth, occupying altogether a space of. about five or six hundred acres.

"Many of the trees, however, are quite sound, and still fit for domestic purposes; and, indeed, they are sometimes used by the proprietors of the neighbouring lands for posts and rails. But the most extraordinary thing we met with, in this expedition to the submarine forest, was a *British flint celt, or axe* embedded in the trunk of one of the decomposed trees, about an inch and a-half, by its cutting edge. This curiosity is now deposited in the Norwich Museum.

Westward Ho!—In the Exeter Museum are flint flakes, Horses teeth, remains of Ox, and *Cervus Elaphus*, which were taken out of the Blue Clay deposit near Westward Ho, 23 feet below high-water mark; also vertebræ of *Cervus Elaphus* from the submerged forest, Bideford Bay.

Since the foregoing was printed, my friend Mr. John Bellows, who has just been in Lancashire, has furnished me with the following account, shewing a great extension of submerged forest in the north-west coast of England, and which is probably a continuation of the one referred to on page 119, as occurring between the Dee and the Mersey; as well as with a specimen of the timber he describes:—

"Happening to mention the subject of submerged forests to T. Lawrenson, a most intelligent inhabitant of Poulton-le-Fylde, he offered to take me to a spot in the low-lying ground about a mile from that town, where trees were to be seen *in situ.* I went with him accordingly to a farm called Little Poulton Hall, which lies on part of the ancient marsh of the River Wyre, and distant seven miles from Fleetwood. In the farm-yard we met with some labourers, who seemed perfectly familiar with the subject of our enquiries. They told us that "moss stocks" [*i.e.* submerged trees] were constantly turning up in ploughing, and that they used the timber for gate posts; that it was principally oak, though a good many "view" trees were found as well. By the direction of the farmer, who had now arrived, we next went to a meadow bordering on a main drain like the "*Rheens*" of Berkeley. In the middle of this field the butt end of a large oak, about 8 feet in girth projected from the surface of the ground at a slight angle; the rest of the tree being buried nearly horizontally under the soil. Its direction was north and south. [The present roughest winds come from the south-west.] The bulk of the timber appeared quite sound; but I managed to break off a piece or two of a projecting part that had somewhat decayed.

"I have also met with a continuation of the same forest on the north of Morecambe bay, near Milnthorpe; and that it covered a very large area is evident from the remarks CAMDEN makes in his article on Lancashire, in the *Britannia.*"

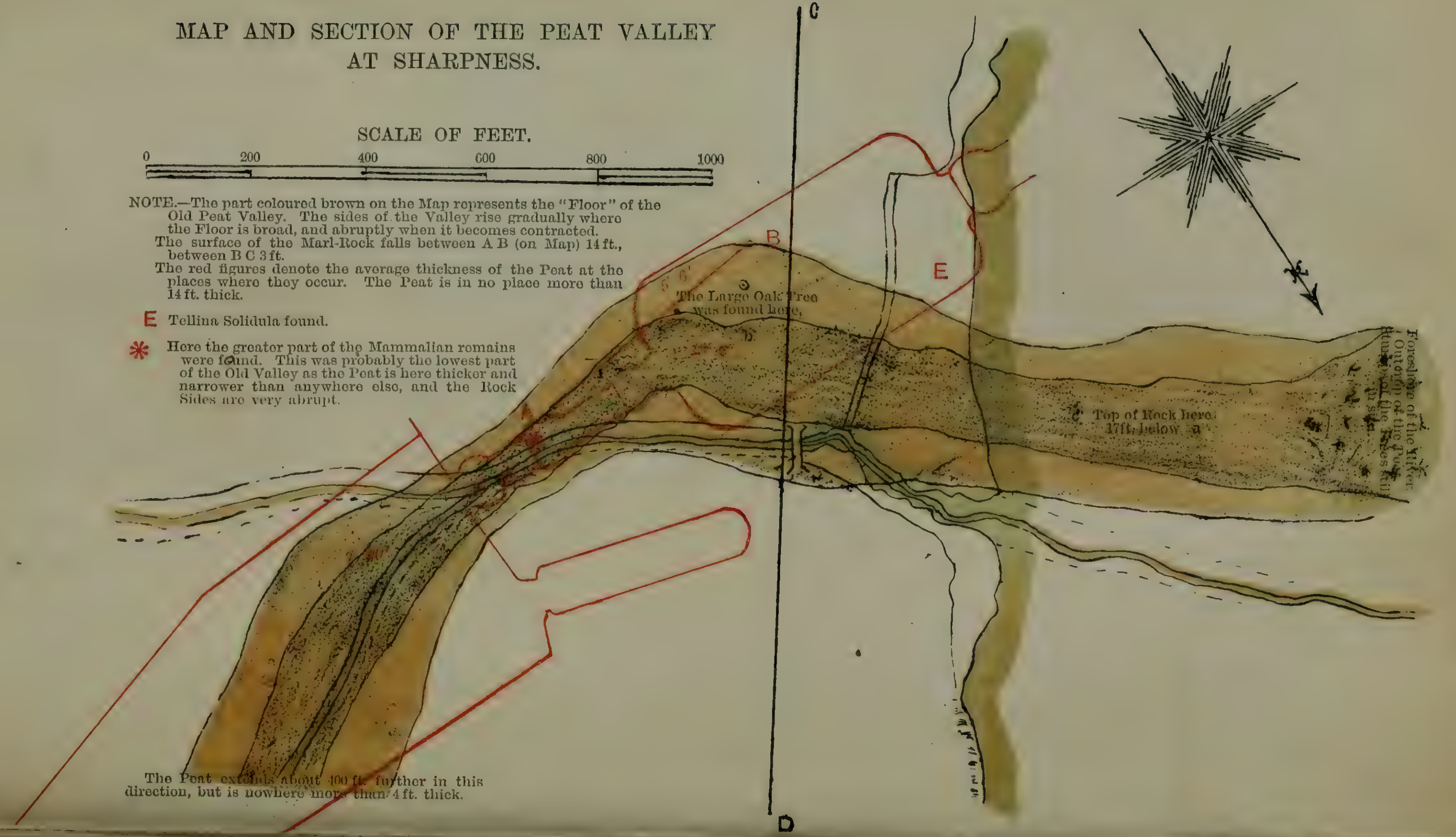
What CAMDEN says about the Chat Moss, in the part referred to by Mr. BELLOWS, is so quaint, and his suggestion as to the origin of the subterranean trees so original, that I cannot refrain from quoting it for the benefit of the "curious company of Philosophers" of the Cotteswold Club:—

"* *Chatmoſſe*, a low moſſie ground, lying a great way in length and bredth: a good part whereof, the Brookes ſwelling high within our fathers remembrance carried quite away with them not without much danger: Whereby, the Rivers were corrupted, and a number of freſh fiſh periſhed. In which place now lyeth a Vale ſomewhat low, watered with a little Brooke, and trees have beene diſcovered lying along. So that it may be thought, when the ground lay neglected, and the chanels were not skoured in thoſe open and flat Valleies for riverets and Brookes to paſſe away, but the water-lades ſtopped up either through negligence, or depopulation: that then all the grounds that lay lower than others, became ſuch boggy plots, as we call *Moſſes*, or elſe ſtanding Meeres. Which if it bee true, wee neede not mervaile that ſo many trees in the like places every where throughout England (but in this ſhire eſpecially) lie overwhelmed, and as it were, buried. For, when their rootes were looſened through over much moiſture, the trees could not chuſe but fall, and in ſuch ſoft ground ſinke and bee quite ſwallowed up. They that dwell thereabouts, aſſay and try with poles and ſpits, where they lie hidden, and when they light upon them marke the place, digge them out, and uſe them for fire wood: For they burne cleere and give light, as well as torch wood, which haply is by reaſon of a bituminous and clammy fat earth wherein they lye: whence the common ſort take them for Firres: which notwithſtanding *Cæſar* denieth to have growne in Britaine. I know it is an opinion currant with the moſt, that theſe trees overturned with the force of waters, have lien ever ſince *Noahs* Floud, when the World was drowned, and ſo much the rather, becauſe they are elſewhere digged out of very high places: and yet they deny not, but thoſe high grounds are very mariſh and wateriſh.

"Such mighty trees alſe are found oftentimes in Holland, a Country of Germany: which the learned men there, ſuppoſe were either undermined by waves working into the ſhore, or by windes driven forward and brought unto thoſe lower and moiſt places; where they ſetled and ſunke downe. But let the curious company of Philoſophers ſearch into theſe matters to whom I commend them, and to their further inquirie, whether there are not Subterranean trees growing under earth, as well as plants and other Creatures."

Britannia, p. 747. Edition 1637.

MAP AND SECTION OF THE PEAT VALLEY AT SHARPNESS.


SCALE OF FEET.
0
200
400
600
800
1000
C
D
B
E
5' 6'
The Large Oak Tree was found here,
Top of Rock here 17ft. below
Foreshore of the River
Outcrop of the Peat
Stumps of the Trees still in situ

NOTE.—The part coloured brown on the Map represents the "Floor" of the Old Peat Valley. The sides of the Valley rise gradually where the Floor is broad, and abruptly when it becomes contracted.

The surface of the Marl-Rock falls between A B (on Map) 14 ft., between B C 3 ft.

The red figures denote the average thickness of the Peat at the places where they occur. The Peat is in no place more than 14 ft. thick.

E Tellina Solidula found.

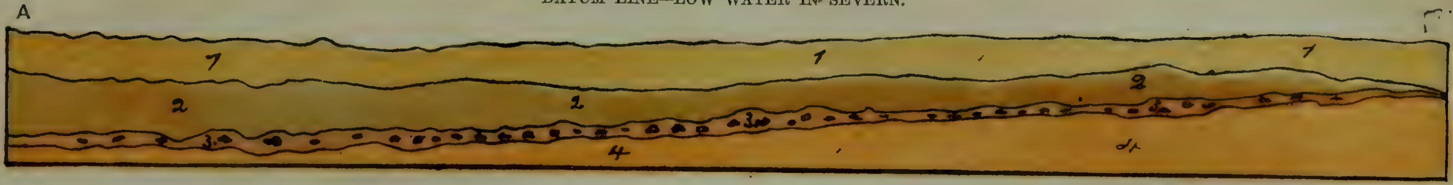
* Here the greater part of the Mammalian remains were found. This was probably the lowest part of the Old Valley as the Peat is here thicker and narrower than anywhere else, and the Rock Sides are very abrupt.

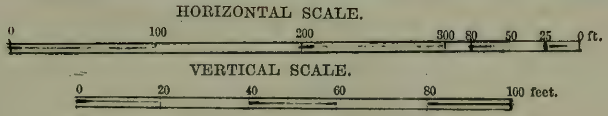
The Peat extends about 400 ft. further in this direction, but is nowhere more than 4 ft. thick.

PEAT VALLEY, HOLLY HAZLE PILL, SHARPNESS.

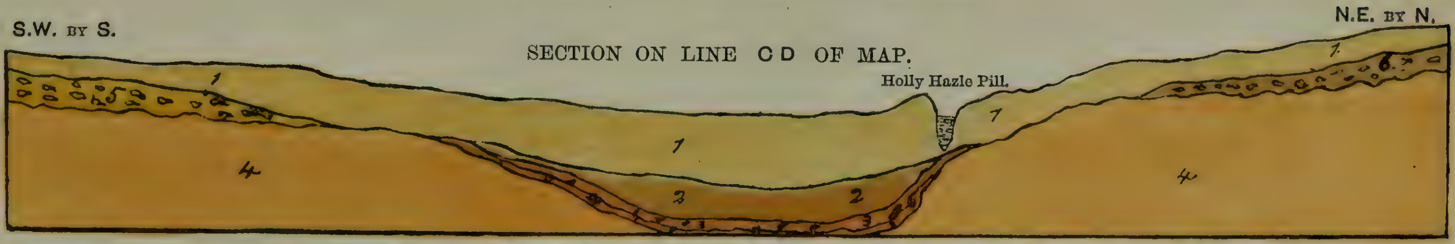
SECTION ON LINE A B OF MAP.

SCALE HORIZONTAL AND VERTICAL, 40 FEET = 1 INCH.
DATUM LINE—LOW WATER IN SEVERN.





SECTION ON LINE C D OF MAP.



1	Soil and Variegated Clays.
2	Peat.
3	Clay with seam of N.D. pebbles, lower portion decomposed Marl.
4	Marl Rock.
5	Oolite with some N.D. Clay.
6	Northern Drift.

NATURAL HISTORY

BRITISH MUSEUM NATURAL HISTORY

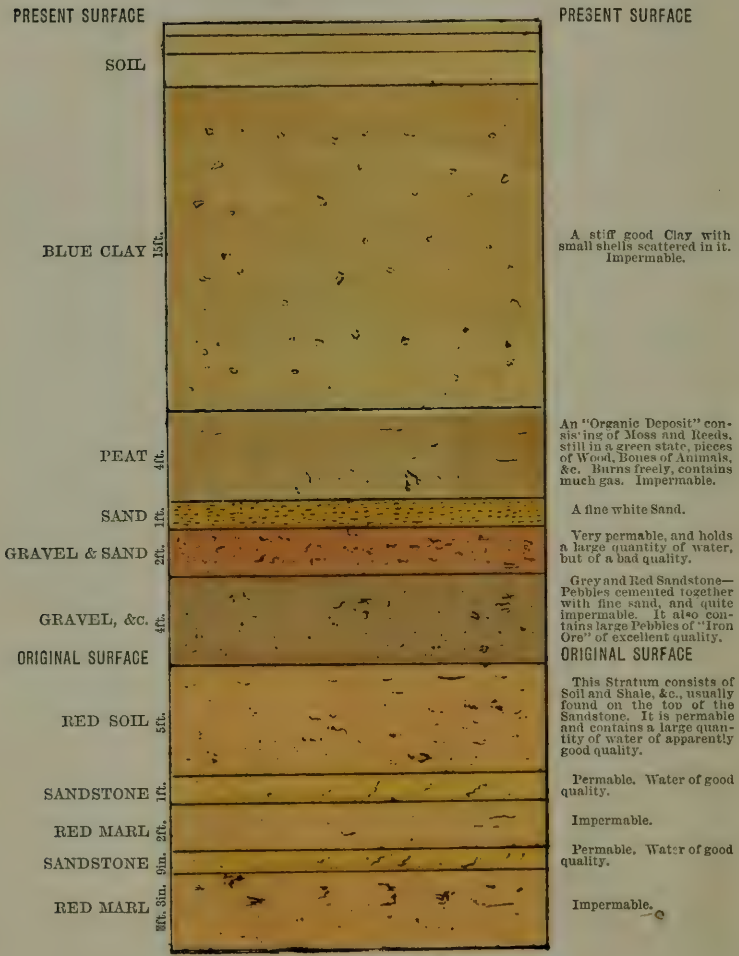
SECTION IN SINKING FOR A WELL

NEAR

LYDNEY BASIN,

SHOWING STRATA PASSED THROUGH,

By GEORGE KEELING,
(OF THE SEVERN AND WYE RAILWAY,) ENGINEER.



A stiff good Clay with small shells scattered in it. Impermable.

An "Organic Deposit" consisting of Moss and Reeds, still in a green state, pieces of Wood, Bones of Animals, &c. Burns freely, contains much gas. Impermable.

A fine white Sand.

Very permable, and holds a large quantity of water, but of a bad quality.

Grey and Red Sandstone—Pebbles cemented together with fine sand, and quite impermable. It also contains large Pebbles of "Iron Ore" of excellent quality.

This Stratum consists of Soil and Shale, &c., usually found on the top of the Sandstone. It is permable and contains a large quantity of water of apparently good quality.

Permable. Water of good quality.

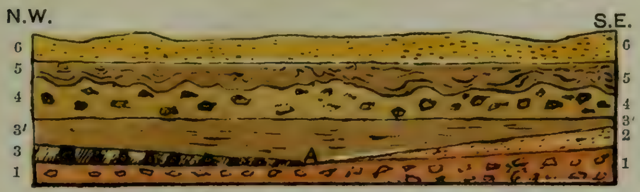
Impermable.

Permable. Water of good quality.

Impermable.

Scale: one-eighth of an inch to one foot.

Diagram to Illustrate the General Succession of the Strata in the Norfolk Cliffs, extending several miles N.W. and S.E. of Cromer, from Sir Chas. Lyell's "Antiquity of Man."



A. Site of Cromer Jetty.

1. Upper Chalk with flints in regular stratification.

2. Norwich Crag, rising from low water at Cromer to the top of the cliffs at Weybourne, seven miles distant.

3. "Forest Bed," with stumps of trees in situ, and remains of *Elephas meridionalis*, *E. primigenius*, *E. antiquus*, *Rhinoceros Etruscus*, *&c.* This bed increases in depth and thickness eastward. No Crag (No. 2) known east of Cromer Jetty.

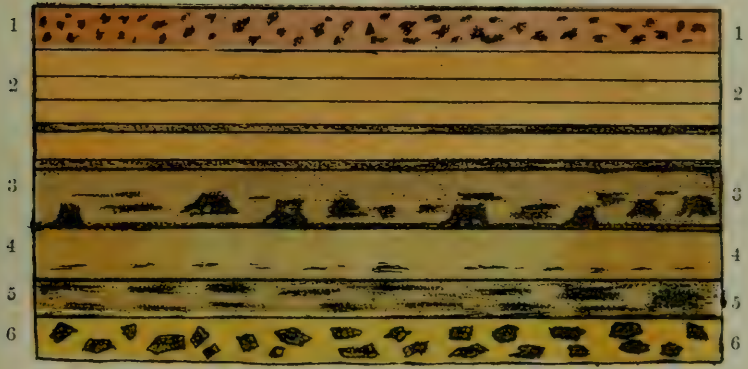
3′. *Fluvio*—Marine Series. At Cromer and eastward, with abundant lignite beds and mamalian remains, and with cones of the Scotch and spruce firs, and wood. At Runton, north-west of Cromer, expanding into a thick fresh-water deposit, with overlying marine strata, elsewhere consisting of alternating sands and clays, tranquilly deposited, some with marine, others with fresh-water shells.

4. Boulder Clay of glacial period, with far transported erratics, some of them polished and scratched, 20 to 80 feet in thickness.

5. Contorted Drift.

6. Superficial gravel and sand, with covering of vegetable soil.

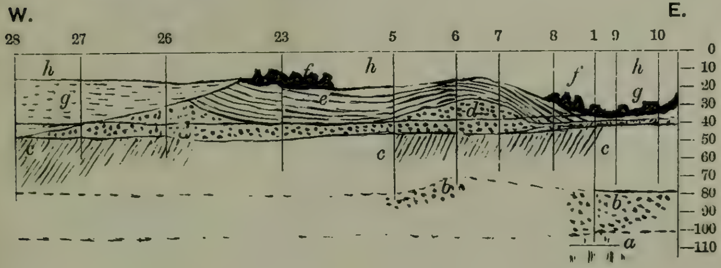
Section made from Mr. Godwin-Austen's Paper on the Porlock Beds.



1. Shingle Bank of Silicious Rocks.
2. Marine Silt with Scrobicularia.
3. Surface of Plant Growths.
4. Blue Mud Deposit.
5. Submerged Forest.
6. Angular Detritus.

BRITISH MUSEUM NATURAL HISTORY

Section constructed from the Borings for the Hull Docks, from Messrs. Wood and Romes' paper, Quarterly Journal Geological Society, May, 1858.



a Chalk. *b* Sand with chalk-rubble (bed *b* of coast-section, fig. 1.) *c* The Purple Clay, called in the borings "brown stony clay with sand threads." *d* The Hessle Sand. *e* The Hessle Clay. *f* Peat-bed with the stools of trees rooted into it and into *e*, and with the stems lying flat in the peat. *g* Silt abounding with Tellina solidula, Scrobicularia piperata, Cardium edule, &c. *h* Salt Water. The length of the section is about one mile—the vertical scale being about eleven times the horizontal.

The numbers along the top denote the Borings as numbered in the Dock Engineers' record, being such of the Borings as (with the exception of 1 and 5) run in a continuous line, about 80 yards from the shore. Numbers 1 and 5 being out of that line and nearer the shore, the depth of the water (*h*) is in their case disregarded.

The vertical numbers denote the depth below the datum line, which is that of high water. The broken lines indicate the presumed continuation of the beds where the Borings do not descend to them. The portion of the section above the horizontal line between the 30 and 40 feet mark is that which was fully exposed during the subsequent excavations; but the excavations were in some parts carried deeper, and into the purple clay (*c*).

Annual Address read to the Cotteswold Naturalists' Field Club, on the 16th March, 1875, by Sir W. V. Guise, Bart., F.L.S., F.G.S., *President.*

Gentlemen,—

In compliance with our established custom, it becomes my duty to lay before you a statement of the present position and prospects of the Club, and to pass in review the work accomplished at our different meetings during the past season.

Before proceeding further, however, I must pause awhile to pay a passing tribute to the memory of the great geologist who has just been removed from us by death. I allude, of course, to Sir Charles Lyell. Few men can have passed away who were mourned by a larger circle of friends than he; and of all that band of philosophical Englishmen who have within the last 60 years raised geology to the rank and importance which it now holds amongst the physical sciences, there have been none who by their writings have contributed more largely to that result than Sir Charles Lyell. For us of the Field Clubs he always felt a fatherly interest, regarding us as helpful workers in that field in which he had won fame; in which, in his earlier years, he had worked as an amateur—as a lover of Nature, for herself and for the truths she taught; which truths and their logical deductions he fearlessly maintained at a time when hard words and cold looks were the social rewards of those who held what were then deemed dangerous doctrines. Happily he lived to see those days pass away. The light of facts and of honest conviction brushed away the feeble cobwebs of bigotry and ignorance, and as the pioneer of a new revelation, he lived to receive those honours and that applause which surrounded him when living, and when dead accompanied his remains with the concourse of a nation's regret to that grand memorial pile at Westminster, where with the great Englishmen of other days, who have by their works, their actions, and their genius made our England famous, the name of CHARLES LYELL is for ever enshrined.

Multis ille bonis flebilis occidit
Nulli flebilior quam mihi.

In this sad obituary I must not omit the loss which this Club and County have sustained within the last twelve months, by the death of two of the original members of the Cotteswold Field Club; I allude to JOHN CURTIS HAYWARD, the late County Chairman, and EDWARD HOLLAND, of Dumbleton, the latter well known as one of the leading agriculturists of Great Britain.

I am glad to have it in my power to report that the position of the Club, both numerically and financially, is in all respects satisfactory. There is no falling off in our numbers, nor in the quality of the papers read before us, as the next number of our transactions will shew; and in the matter of finance, our excellent Secretary and Treasurer reports, so well and economically have our funds been administered, that at the end of May the Club will have in hand at least £100.

With these prefatory, and I hope satisfactory remarks, I will now proceed to give a review of the work done, and the ground traversed by the Club at its different Field Meetings, during the past season.

THE ANNUAL MEETING

of the Club was held at the Spread Eagle Hotel, Gloucester, on Thursday, 12th March, 1874, when the officers were chosen, and the places of Meeting for the season were fixed; you then renewed the honour you have for so many years conferred upon me by electing me your President, with Dr. WRIGHT and Mr. LUCY as Vice-Presidents, and Dr. PAINE as Honorary Secretary.

The latter read the financial statement, which showed that a large amount of arrears had been collected, and that the funds of the Club were in a thoroughly satisfactory state. The President then read his Annual Address, giving a summary of the work done, and the papers read at the different Meetings of the Club, during the foregoing season.

After dinner, Mr. ETHERIDGE, F.R.S., read a paper, illustrated by splendid sections, on the "Cambrian Beds of St. David's, Pembrokeshire." Mr. ETHERIDGE first gave the history of the Cambrian question as originally proposed by SEDGWICK many years since, in contradistinction from the view held on the same subject by Sir RODERICK MURCHISON. He then described the features of St. David's promontory, the section in the Harleck and Longmynd rocks at the base, and the succeeding "Menœvian" and "Tremadoc" beds, on either side of the N.W. axis. The sections at St. David's were compared with the Longmynd and Malvern areas, and correlated with the more distant localities where possible. The "fauna" of the several series in the Cambrian and Lower Silurian rocks were noticed, and their relation through the ascending groups of beds were minutely detailed. Mr. ETHERIDGE noticed the labours of Mr. HICKS and Mr. SALTER over the same area. He then made reference to the Laurentian Cambrian and Lower Silurian rocks of the N.W. of Scotland, and endeavoured to shew by correlation their distribution southwards. The Lower Silurian rocks of St. David's, viz.: the "Arenigs" and the "Llandilo" beds, were then briefly described as tending to complete the geology of the St. David's promontory.

The reading of this paper, of which the foregoing *resumé* gives but a meagre outline, left many points standing out in prominent relief; of these none left a deeper impression than the fact most forcibly revealed by the study of these remarkable sections,—that types of life appear to have come suddenly into existence; not, as was at one time conceived, in a rudimentary condition, but, as it were, to have sprung into perfection at a bound. Thus, beginning with the basement rocks of St. David's, which appear to exhibit but doubtful traces of life, the observer finds himself suddenly introduced to the earliest types of Crustacean life, not, as might be expected, in its most embryonic and least developed form, but to a giant of its race—the grand Trilobite "Paradoxides"—measuring more than 18 inches in length, and this side by side with the minute and eyeless "Agnostus," which when first found in the "black shales" of Malvern, was supposed to indicate, by the rudeness and imperfection of its structure, the dawn of a new form of life.

These, and many other points bearing upon the question of the beginning of life on our earth, and their relation to philosophy and religion, were touched on with fervour and eloquence by Dr. WRIGHT, who seconded the President's vote of thanks to Mr. ETHERIDGE, for a paper of no ordinary interest and value.

The first Field Meeting for the season was held at

NEWENT,

on Tuesday, the 14th May, with a view to the examination of the Newent Coal-field. At this locality the coal crops out at the surface, and has not unnaturally led to the belief that by following up the indications thus given, large fortunes may be realised. Iron, too, is yielded by beds in the immediate neighbourhood, which hold out promises of wealth to be derived from the extraction of that mineral. But in both these cases it is probable, from geological reasons, that the prospects thus held out are delusive. It was with a view, therefore, of bringing the eyes and the knowledge of geologists to bear upon the problems there presented, that the first Field Meeting of the Club for the season was appointed to take place at Newent. The day was fine and bright, and the drive delightful, over a beautiful country, to which the fresh livery of Spring imparted the additional charm of colour. Passing through Newent, the party proceeded about two miles on the Dymock road until they reached the foot of an artificial mound known as the "Castle Tump," where they descended from their carriage, and from that point pursued their journey on foot.

From the summit of the "Tump" a grand panorama lies stretched around, admirable in its picturesque beauty of hill and dale, and telling a tale of geological time and change truly marvellous to him who ponders on these things. No fitter place for a lecture on such a subject could be selected than the "Castle Tump" at Dymock; and here those assembled had the pleasure of listening to an address from their associate, Mr. Symonds, of Pendock, than whom few are so well qualified to impart knowledge on such a theme. Commencing with the distant oolitic ridge of the Cotteswolds on the south-east, and the Malverns and May Hill on the north-west, he described in detail the physical geology presented by the Lower Lias and Rhætic rock, down to the Newent and Bromsberrow sandstones of the Lower New Red Sandstone, which come up to the flanks of the "Castle Tump," and stretch away eastward to Redmarley, Hazeldine, and Bromsberrow. He directed attention to the outlines of Berrow-hill, within 2 miles of the Chase-end hill of the Malvern range, Sarnhill, near Tewkesbury, and Queen hill near Upton-on-Severn, as evidences of the former extension of the Lias of Corsewood hill and Hasfield, of Tewkesbury Park and Brockeridge, on to these outliers now isolated in the vale, and from them on to the ancient coast line presented by the Malvern hills, in times when a liassic sea washed their shores. Mr. Symonds then described the Trias or New Red Marls as they are seen to emerge from beneath the Lias. These he divided into upper, middle, and lower beds, of which the lowest, known as the Bromsberrow or "Bunter" beds, are distinguished by the deep, almost blood-red tint which everywhere on the Continent of Europe as well as in England, appears to characterise them. These rocks rest unconformably upon the Palæozoic series, the upper member of which, known as the "Permian," is well seen at Hasfield, whose wooded eminence rising above the residence of Dr. Henry, and forming a conspicuous feature in the landscape, was pointed out by the lecturer. Here the Permian beds are seen dipping at a high angle against the "Bunter" beds. The Coal-measures which underlie the Permian are thrown down in a vast "fault" between the Permian and the

Old Red Sandstone, and are thus *lost*, with the exception of a small patch which constitutes the so-called Newent Coal-field. The complication of the beds at this point is very great, and is due to the force exerted by the protrusion of the Sienitic range of the Malverns, which taking place in later Permian times, has upheaved, thrown down, compressed, and shattered the Palæozoic beds in the neighbourhood, causing a vast elevation of the strata on their western flanks, and a corresponding down-throw on the east. This, said the lecturer, is the key to the geological history of the elevation of the May Hill and Forest of Dean districts on the one hand, while the undulating plain at the foot of the Malverns to the eastward, is due to the Mesozoic beds resting almost horizontally on the upturned and denuded edges of the great eastern down-throw.

From the "Castle Tump" the party proceeded under the guidance of Mr. Symonds along a ridge of Permian "breccia" charged with iron, having the "Bunter" beds abutting against it on the east, and on the west the Old Red Sandstone, between which and the Permian beds is squeezed in a small patch of Coal-measure "shale". An abandoned iron-mine was visited, which has been sunk in the Permian on the dip of the beds, here pitched at a high angle; but the percentage of iron being found to be too small to repay further excavations, it was soon abandoned. From this point a pleasant ramble over green fields brought the party to the Hill-House Colliery. The workings appeared to be on a very small scale, but were probably quite commensurate with the importance of the venture. The beds are here thrown on edge, and are so crumpled and crushed by the enormous forces which have upheaved the "Old Red" and "Carboniferous" beds, that there is small probability that coal can ever be worked so as to yield a result of economic value; though, as Mr. Symonds remarked, there seems no reason why coal of a workable quality may not be found at points more remote from the great centre of disturbance.

It was now past one o'clock; the wayfarers had been on their legs for two hours, and the desire for food began to be uppermost in their minds, when, to the delight of all, appeared a table spread in the wilderness, on which was displayed a most excellent luncheon, provided by the kindly forethought of Richard Foley Onslow, Esq., of Stardens. Time did not admit of long delay, so having thanked their host for their entertainment, the party moved forward to Gorsley, at which place there is a fine exposure of "Silurian," in quarries where the "Ludlow" Rock—here a hard impure limestone with "*Chonetes lata*," and other characteristic fossils—is extensively quarried for road material. These strata, which are nearly horizontal, are capped by the yellow beds known as the "Downton Sandstones," which form the junction between the "Silurian" and "Old Red" deposits. From this point the party made the best of its way to the George Inn, at Newent, where dinner was awaiting them. After dinner Mr. Symonds read a paper which he had prepared, on the "Newent Coal Field." After describing at some length the geologic conditions which govern the Coal-bearing strata in the Newent district, he showed how the speculators after coal in that field had always selected the very edges of lines of "fault" wherein to sink their shafts, all which was waste of time and money, and might have been avoided had the adventurers possessed the most elementary knowledge of physical geology. He further gave it as his opinion, that if ever coal-speculation is to be prosecuted with any hope of a renumerative result in that district, it must be at some point further removed from the lines of "fault" which he had indicated. They might dig under Newent itself with more hope; at Colin Park and westwards of it with better hope still; so also eastwards of Pauntley or Tibberton; but he held it to be a pity that good gold and labour should be squandered *on faulted ground.* In conclusion he recommended prospecting for coal in these parts to *Companies, not to individuals*, and above all, *not to his own friends.*

The Second Field Meeting of the Club was held at

WESTON, NEAR BATH,

on Thursday, 25th June.

The programme for the day included an examination of the Rhætic and Lower Lias, Weston; of the coal-sinkings at

Pennyquick Bottom, the most easterly part of the Bristol coal-basin; the ascent to the Great Oolite plateau at Odd Down, the descent thence to the Midford valley, for the purpose of examining the "Midford Sands," and return to Bath by way of Beechen Cliff.

The party, nearly fifty in number, assembled at the Weston Station on the arrival of the 12.32 train, and proceeded at once along the line of rail to examine a quarry and section about a quarter of a mile distant. At the quarry Mr. C. Moore, F.G.S., drew attention to a band of shale or marl overlying the thickly-bedded rocks of the "Bucklandi" zone, as marking a special horizon, traceable in all the Lias quarries throughout the district. This band indicates a change in the character of the deposition, which is marked by the presence of a peculiar fish-fauna, as evidenced by the occurrence therein of teeth of *Hybodus*, *Acrodus*, *Leptolepis* and *Dapedium*. The section next visited—a wide, open clearing on the line of rail—presents one of the finest and most characteristic expositions of the "White Lias" in the district. This section embraces the whole series of beds from the "Keuper" upwards. The "Bone-bed" does not occur on any special horizon, but as distributed over several different beds. The "White Lias," about 12 feet thick, rests on the "Cotham Marble," or "Landscape-Stone," which is about a foot in thickness. At the top of the Lias occurs the so-called "Sun-bed" of William Smith, above which are the "*Ostrea liassica*" beds. The "Planorbis" zone is here absent. A list of the organic remains from the Weston quarries is given in Mr. Moore's paper on "Abnormal Secondary Deposits" in No. 92 of the *Quarterly Journal of the Geological Society* for December, 1867.

After luncheon, which was provided by Mr. Handel Cossham, the party proceeded by way of Cross Post Gate and Tiverton to Pennyquick coal-pit. At this point a shaft is sunk through the Lower Lias to a depth of about 160 feet. The beds of coal to be reached are those of the lower coals of the Bristol basin, on the extreme edge of which the shaft is made. The coals being sought for on the edge of a "fault," will probably prove to be much broken and of inferior quality. From Pennyquick the carriages ascended the steep hill by the Old Foss-way, and passed over the "Inferior Oolite" and "Fuller's Earth" beds to the plateau of the Great Oolite at Odd Down, (ascertained by aneroid to be 450 feet above the Avon at Bath,) and descended on the other side into the valley of Midford, where the new line to Evercreech was in process of construction. Here an excellent section was presented, cut out of the "Midford Sands" of WILLIAM SMITH, and by him considered to occupy the place of the Upper Lias—a wonderful example of the diagnostic faculty of the "Father of Geology," which later and more exact knowledge has confirmed. These beds are doubtless the equivalents of the "Upper Lias Sands" of Frocester Hill, and are overlaid at this point by the "Trigonia Grits" of the "Parkinsoni-zone," representing the highest beds of the "Inferior Oolite"—the "Oolite Marl" and all the subjacent beds (200 feet thick) being absent; and this is found to be the succession of the beds throughout the Bath district.

At four o'clock the party assembled at Mr. COSSHAM'S new residence at Weston Park, where about fifty sat down to a sumptuous entertainment provided by their kind and generous host, this being the third successive year in which the Cotteswold Club has partaken of the same splendid hospitality. Dinner being over, and the toasts loyal and personal having been given and duly responded to, Dr. WRIGHT was called upon by the President to read his promised paper on "The Genesis of the Oolites." The lecture was illustrated by excellent figures and sections.

The Doctor commenced by saying that this subject had long occupied a place in his thoughts, and that only of late it had gathered such form and consistence as would permit him with confidence to put it forward. He had long been persuaded that, without an intimate knowledge and study of the structure of the *Zoophyta*, it was not possible to comprehend the incalculable importance of those obscure creatures in the seas of ancient and modern times. He briefly described the anatomy of the "Sea Anemone" as typical of a large section of these Zoophytes, and pointed out the difference between those which have no calcareous skeleton, like the "Sea Anemone," and those which build coral structures or reefs in tropical seas; the calcareous material of which they are constructed being derived from the water of the ocean, and by colonies of these tiny architects working in unison, structures of gigantic proportions are produced. The lecturer then shewed how the reef-building corals can only live and work in water having a temperature of from 80° to 82°, and as that condition is now chiefly found between 30° north and south of the equator, their operations are for the most part confined within those limits; while even in *those* latitudes, where the ocean is traversed by cold currents, their Zoophytic life is absent. He then explained that in certain areas of the earth's surface some portions are subsiding while others are rising; that observation had shewn that the Coral sea of our time is a vast area of depression, and that the life-conditions within that area being very favorable to the development of the Polyp, there was a prodigious growth of reef-secretion; that when they built around land, it formed a "fringing reef;" when that land underwent a further subsidence, it became a "barrier reef;" and that when the land became entirely submerged, rings of coral, like Whit-Sunday Island, alone remained to attest the former presence of *terra firma.* He then explained how the waste of the reef is ground into a fine mud or coralline sand, that the calcareous paste coats particles of sand which become cemented around the nucleus, and how, by the constant roll and agitation of an ever restless sea, these physical conditions lead to the production of oolitic limestones, which are found around the shores of coral islands of our own time. Having thus established the fact that oolitic limestones are produced under the conditions just described, he proceeded to apply this natural history fact to an explanation of what had not hitherto been attempted, namely, the genesis of the oolitic rocks, some of which they had that day seen. He said that the oolitic series of rocks may be described generally as a succession of argillaceous deposits, as the Lias, Oxford Clay, and Kimmeridge Clay, with interposed beds of oolitic rock, such as the Inferior Oolite, the Coralline Oolite, and the Portland series; that the Coralline theory applied only to the oolitic limestones, for the argillaceous deposits have clearly been formed under other conditions. Nearly all the oolitic limestones contain coral structures more or less extensive; in the Inferior Oolite were three distinct reefs super-imposed on each other, having intermediate beds of oolitic rock; the Great Oolite had its reef, the Coral Rag possessed its reef, and the Portland beds contained zoophytic productions in like manner. Now there was no doubt in the mind of any one who saw such a rock as he (the lecturer) held in his hand, but that it was a mass of coral secreted by a Jurassic Zoophyte. But what was the roe-stone or Oolitic rock which rested upon the reef? He submitted that it was neither more nor less than a portion of the wasted reef which had been broken and triturated and ground into mud; that the paste had coated particles of sand, and the whole had been cemented by the calcareous waters, and formed into the rock we call Oolitic Limestone. For all these granules had a nucleus, and the calcareous globule was made up of a succession of laminæ, as may readily be seen in thin sections of the rock prepared for the microscope. So the genesis of the oolitic rocks was due to the vital energies of the zoophytes that lived in the Jurassic seas. The reefs that remained were mere fragments of those which had once existed, and the reefs that had disappeared had furnished the materials out of which the oolites had been constructed. The same explanation would apply to the Oolitic beds found in the Carboniferous Limestone, which had been formed by the waste of the Coral beds in the Carboniferous seas. But the oolitic grains of the Carboniferous oolites had often a small foraminiferous shell as a nucleus, instead of the particles found in the Jurassic oolites; but in both cases the process of production was the same; the granules had been rolled along a shore and cemented into a rock by a calcareous cement, just as Oolitic beds are now in course of formation along the shores of the coral reefs of our own day. There was only one true method to interpret Nature, and that was to watch how she proceeded in any of her operations, and thus, having learned her *modus operandi*, to explain the unknown by the known. There was another point connected with the subject which the lecturer glanced at, namely, the subject of geological time, which he illustrated by shewing how that all these reefs in the different oolitic rocks had been built by different species of zoophytes, and as the life of individual species was of long duration, as proved by the zoophytes which construct the reefs in the Gulf of Florida, so then the life of the species in the Jurassic age, if they lived as long then as they do now, justified the inference that the genesis of the oolites was a very old and a very long story indeed.

Dr. WRIGHT exhibited a beautiful drawing in colour, by his friend Mr. BEACH, who had enlarged it from an illustration by Professor HEER, shewing the ancient physical geography of the land with its plants and animals in the Jurassic sea.

Dr. WRIGHT'S paper was followed by one by Professor DYER on "Clayey Partings in the Cotteswolds." The observations contained in this paper were directed to the composition of the clay in these fissures, and a comparison was instituted between the chemical constituents of the clay in question and that found under somewhat similar conditions in the Bahama Islands.

The third Field Meeting for the season was held at

RADSTOCK,

on Wednesday, 22nd of July.

In the year 1872, the Club had visited that portion of the Bristol Coal-field known as the Kingswood and Parkfield Collieries, the physical conditions of which were explained, and their relations to the Radstock basin to the south made clear, by our colleague Mr. ETHERIDGE, who contributed a valuable paper on the subject to the published Transactions of the Club. It only remained, in order to complete their survey of the entire coal-field, that a visit should be paid by the Club to Radstock, which place was accordingly made the *rendezvous* on the day and date above named.

The members were met at the Radstock station by Mr. McMurtrie, mineral agent to Lady Waldegrave, whose intimate acquaintance with the district under review, aided by admirable diagrams, and a clear and well marshalled explanation of facts,rendered that easy of comprehension, which, without such guidance, could not have been apprehended by any interpreter of mere surface geology.

Not the least remarkable fact in connection with this coal-field is the circumstance of the coal having to be sought for through a considerable thickness of overlying deposits, ranging from the "Keuper" to the "Inferior Oolite," through which shafts of varying depth have to be sunk, to reach the coals below. According to the calculations of Mr. Charles Moore, F.G.S., the minimum thickness of "Keuper," "Lias," and "Oolite," overlying the coal measures in the Radstock district, is only 160 feet, as contrasted with 3000 feet outside of that area. The supposed cause being the existence of the Mendips as a land area which partially prevented the incursion of the secondary deposits.

After leaving the Radstock station, the members were conducted to the "Wells-Hill" quarry immediately adjoining, where they had an opportunity of examining a section about 30 feet in thickness, showing the "Lower Lias" resting on the "Sun-bed" and "White Lias" of the "Rhætic" series.

The party next proceeded to South Hill, Radstock, the residence of Mr. Mc.Murtrie, where they inspected a collection of fossils, accumulated for many years by that gentleman. It embraced specimens from all the principal divisions between the "Cambrian," and the "Chalk," and amongst them, Dr. Wright detected two Ammonites which had not been figured or described. The principal feature of the collection, however, was a series of beautifully preserved specimens of plants, from the Somersetshire Coal-measures, which display a fossil flora of greater variety than is to be met with in any other coal-field in this country. The "fauna" of the district is not rich, but one or two fine specimens of "*Limulus*" were found a few years ago by the late Mr. G. Feare, of Camerton, and one of these which had been figured in the Transactions of the Manchester Society, was shown to the members.

Mr. Mc.Murtrie here submitted to the Club a series of diagrams and sections, illustrative of the Somerset and Gloucestershire districts. The chief features pointed out were :—

1st.—The fact that the Mendip range had originally been upheaved by a protrusion of "trap," discovered within the last few years by Mr. Charles Moore.

2nd.—That this upheaval had, over a district of country four miles in length, folded the coal-measures back upon themselves, causing them to dip southwards *towards* the range, instead of northwards, and *from* it.

3rd.—That a mass of Mountain Limestone, three-quarters of a mile in length and a quarter of a mile in breadth, which has been thrown over with the coal-measures, now overlies them, at a distance of a mile from the parent mass whence it was derived.

4th.—That through the folding of the coal-measures, lateral pressure has been produced, causing a slide or overlap fault in the centre of the basin, where the coal-veins and associated beds have been thrust forward to the extent of 300 yards.

From Radstock the members were conveyed in brakes to a cutting on the Evercreech line, at Lynch House, near Old Down, where the New Red Conglomerate, the Keuper, the Rhætic Shales, and White Lias, are seen in a highly contorted condition. Proceeding southwards towards Nettlebridge, an ancient encampment was visited, called the "Bulwarks," supposed by Collinson to be of Roman age. The party then proceeded along the edge of the hill overhanging the Nettlebridge valley to Holcombe, where in an abandoned quarry the abnormal dip of the coal-measures was pointed out.

From this point they proceeded to Upper Vobster, where the isolated mass of Mountain Limestone overlying the coal-measures, which has been already referred to, was examined at several points. This remarkable phenomenon in physical geology completed the day's excursion, and is itself worth going a long way to see. A huge mountain of Carboniferous

Limestone detached from its parent rock, and lying on the coal-measures which pass without any displacement beneath it, is one of those gigantic examples of cosmic forces in by-gone epochs of the world's history, which presents to the geologist a most difficult problem for solution. The solution appears to be this, that the upthrust of the central mass of trap, caused not merely the upheaval, but the absolute "*bouleversement*" of the overlying beds. The Limestones were thrown over on the coal-measures, and denuding forces since operating, and still in operation, have gradually worn away all traces of the great catastrophe, leaving only the displaced rock-masses at Vobster, as evidences of the mighty disturbance which once convulsed that area.

On their return to Radstock, the party found that Mrs. Mc. Murtrie, acting under instructions from Lady Waldegrave, the Lady of the Manor, had provided for them a sumptuous entertainment under a tent, and it is scarcely necessary to add that this act of kindness and hospitality was most welcome and highly appreciated. Mr. Mc.Murtrie was requested by the President to convey to Lady Waldegrave the best thanks of the Club, which were likewise warmly tendered to Mr. Mc.Murtrie himself, for his kindness and attention, and for the instruction so admirably conveyed by his diagrams and explanations.

The fourth Field Meeting of the Club for the season (postponed from August 19th) was held at

FARINGDON, IN BERKSHIRE,

on Tuesday, 22nd September.

The programme for the day embraced a visit to the following points:—Fernham, Cole's Pits, Boutcher's Pit, Ballard's Pit, Hedding's Pit, Great Coxwell Barn, and Bradbury Hill and Camp.

Mr. Davey, F.G.S., of Wantage, acted throughout the day as guide to the Club, and I am indebted for all the information which I am enabled to lay before you on these very interesting and obscure beds to the labours of this gentleman in this special field, the results of which labours are embodied in a series of papers contributed to the Transactions of the Newbury District Field Club.

The place of the Sponge Gravel beds of Faringdon have been the subject of much controversy among geologists, but it is now generally conceded that they belong to the Lower Greensand of English authors, equivalent to the Upper Neocomian and Aptian of French and Swiss geologists. These beds in the Faringdon district are of very limited extent, not exceeding one mile in length by a quarter of a mile in breadth, with a thickness of from 25 to 40 feet. The contained fossils are of two classes—the remains of creatures that lived and died on the spot, and the remains of such as were derived from pre-existent beds, in particular, from the "Kimmeridge Clay" and "Coral Rag." These consist principally of Vertebrates, Fishes, Saurians, and Turtles. Those natural to the spot include Sponges, Polyzoa, Echinoderms, Serpulites, and Bivalve Mollusks.

At Fernham village the party halted to inspect the most southerly outcrop of the Sponge Gravels, which here assume the form of a hard compact conglomerate. Mr. DAVEY here read some short notes extracted from papers by HULL and SHARPE, illustrative of the points under notice.

From Fernham the party walked to Cole's Pits, a cluster of 273 basin-shaped excavations extending over 14 acres, which have been conjectured to represent ancient British habitations, but they are on far too large a scale to have been suited to any such purpose, some of the excavations being from 25 to 40 feet deep. They may doubtless be accepted as the vestiges of ancient quarrying for sandstone and iron.

Boucher's Pit showed about 25 feet of gravel, full of portions of sponges and polyzoa. This was probably a beach or shoal in the old Greensand sea. This is an interesting spot, because there in all probability LLWYD collected the series of fossils deposited by him in the Ashmolean Museum, at Oxford, nearly 200 years ago. Ballard's Pit proved highly interesting. It is of large size, covering nearly two acres of ground, and is quite a museum in itself; rich in sponges, which, from their abundance, have given a name to the deposit, and are in themselves very beautiful objects, their form and condition being frequently as perfect as when they grew on their ancient sea-floor. Of these a large collection was made. The following were identified on the spot:—*Tragos faringdonensis, Manon marginatum, M. porcatum, M. peziza, Oculospongia, Verticillites anastomosans, Chenondopora fungiformis, Jerea Desnoyersii*, and *Scyphia foraminosa.*

The attraction here proved so great, and the delay in consequence was so prolonged, that the accomplishment of the entire programme was impracticable. Hedding's Pit was not visited, and Bradbury Camp was only seen at a distance. Some time, however, was given to the inspection of Great Coxwell Barn, a 14th Century structure of vast size and solidity, erected by alien monks in connexion with the Abbey of Beaulieu, in Normandy, who held manorial rights in Faringdon and Coxwell. This is a grand piece of masonry, about 150 feet in length by 40 in height, having four lofty arched entrances, and the roof supported by timber up-rights and cross-pieces of imposing strength and size.

The party dined together at the Crown Inn, Faringdon, and returned to Gloucester by the "Down Express," carrying with them a fine series of fossils from the "Sponge Gravels," and the recollection of a day of more than usual interest and instruction.

This was the last "field meet" of the season—a season which may be regarded as one of marked success. The Meetings have been well attended, the localities selected have yielded much of interest and instruction, and the papers read before the Club, which will appear in the next number of our printed Transactions, are such, as from their high character, cannot fail to add to the reputation and give value to the publications of the Cotteswold Field Club.

Observations upon a Bed of Fuller's Earth at Whiteshill, near Stroud, by E. WITCHELL, F.G.S.

In a paper published in the Transactions, Vol. 4, p. 227, I expressed an opinion that the dry valleys or Combes of the Cotteswolds, have been in a great measure formed by the erosive action of springs thrown out by the Fuller's Earth, at a period when that formation extended westwards over the whole district. That in the course of time the Fuller's Earth was removed by denudation, and in consequence, the springs ceased to flow, and the Combes became dry.

This opinion has been recently confirmed by the discovery of Fuller's Earth at Whiteshill, near Stroud, in explanation of which, the following observations are made.

It is scarcely necessary to mention that along the outer Escarpment of the Cotteswolds the Capping consists of the Trigonia beds of the Inferior Oolite, or, where those beds have been removed, by the Freestones; it is only where a deep bay breaks the line and is prolonged into a Combe, that the Fuller's Earth is seen near the Escarpment, and in these particular instances there are springs in the Combes above the Inferior Oolite. The Combes at Crickley and Selsley Hills, may be cited as examples. The long ridge which commences at Doverow Hill, near Stonehouse, and terminates near Birdlip, contains several Combes which at a higher level than the lias are dry, and it is upon a spur on the south side of this ridge at Whiteshill, north of Stroud, that I have discovered the presence of Fuller's Earth. The spur in question is formed by two Combes, running nearly parallel with each other, the direction being north-east and south-west. The Combe on the north-west of the spur commences as an undulation, and gradually deepens until it passes downwards through the Freestone beds, where it is contracted into a gorge. Near the top of the hill there are indications of a fault running across the spur, the ground being slightly depressed on each of its slopes. The Fuller's Earth is in the depression which runs down into the gorge on the north-west; it occupies a small area but it is of considerable depth, a well having been recently sunk in it to the depth of 35 feet. From the well it may be traced down the slope of the Combe, and across it to the other side. It contains broken pieces of thin shelly bands, which characterise the formation, with valves of *Ostrea acuminata*. Its preservation is due to the exceptional character of the depression in which it lies. On the sides of the depression the Trigonia beds are in situ. There must therefore be a fissure in the Inferior Oolite of considerable width and depth, into which the Fuller's Earth sunk down or slipped from the higher ground—probably the latter, because it continues into and across the bed of the Combe, as before stated. In the Combe it would of course be subject to the wasting action of the springs which continued to run down its bed while any Fuller's Earth remained on the higher ground to throw off the water, but before the Combe was cleared the springs ceased to flow, and the deposit of Fuller's Earth remains, except so far as it has been since wasted by surface drainage. There is no other trace of Fuller's Earth between Doverow Hill and Birdlip, and the nearest bed of Fuller's Earth is two miles distant from Whiteshill. I have considered it desirable to place upon record the fact of the presence of Fuller's Earth at this place, as bearing upon the subject of denudation, and as evidence in confirmation of the opinions I have before expressed upon it.

On the Angular Gravel of the Cotteswolds, by E. Witchell, F.G.S. *Read at Birdlip.*

The Angular Gravel of the Cotteswolds has been frequently alluded to in the Transactions of the Club and elsewhere, and various opinions have been expressed as to its origin; but the manner in which the Gravel beds have been deposited in the positions in which they are found, and their relative age, are still involved in some obscurity. No apology, therefore, is necessary for again introducing the subject to the notice of the Club, and inviting further discussion upon it.

The Gravels of the Cotteswolds may be separated into three kinds, namely: the Angular Gravel of the slopes, the rolled Oolitic Gravel of the river valleys, and the Northern Drift. It is the former only which is the subject of the present paper.

The earliest reference to angular detritus which I have seen is that contained in the "Geology of Cheltenham," as revised by our Colleague, Professor Buckman (Ed. 1845.) It is stated: "Heaps of this rubbish, which have been washed down by storms and rain from the escarpments, often hide from view the real position of the Lias in the sloping escarpments of the Cotteswolds." It would appear from the section to which reference is made, that this remark is intended to apply to the whole mass of detritus which everywhere covers up the slopes of the hills, and not merely to the Gravel.

Mr. Hull, writing upon this subject in the Memoir of the Geological Survey of East Gloucestershire, published in 1847, mentions several localities where the Gravel is exposed. His impression was that the Deposits were the remains of sea beaches, indicating a sea level of 700 feet higher than at present. Dr. LYCETT, in his excellent little book, "The Geology of the Cotteswold Hills" (1857), concurred in this view, and he has given a section of the valley at Brimscombe, in which there is a bed of Angular Gravel at Hyde, at a high level, and a bed of river Gravel in the bottom of the valley.

In a paper, read in 1866, on the denudation of the Cotteswolds, I alluded to the Angular Gravel, and suggested that it was formed of oolitic detritus disintegrated by frost, washed down by streams, and deposited in positions which at that period were the bottoms of the valleys then in course of being excavated.

Mr. LUCY's paper followed soon afterwards, in which he describes the Gravel as generally found at the foot of the Inferior Oolite, or resting upon the upper Lias sands, in all cases running up to a point where the combe rises at a considerable angle. That it is composed of the freestone of the Inferior Oolite, without any fossils or even recent shells. His impression was that it was attributable to frozen snow or land ice, which, when the thaw set in, would slip down, carrying with it the detritus of the freestone, and was of the age when the climate had become comparatively mild.

Some of these opinions have undergone considerable modification, and we may dismiss that which refers to sea beaches as abandoned.

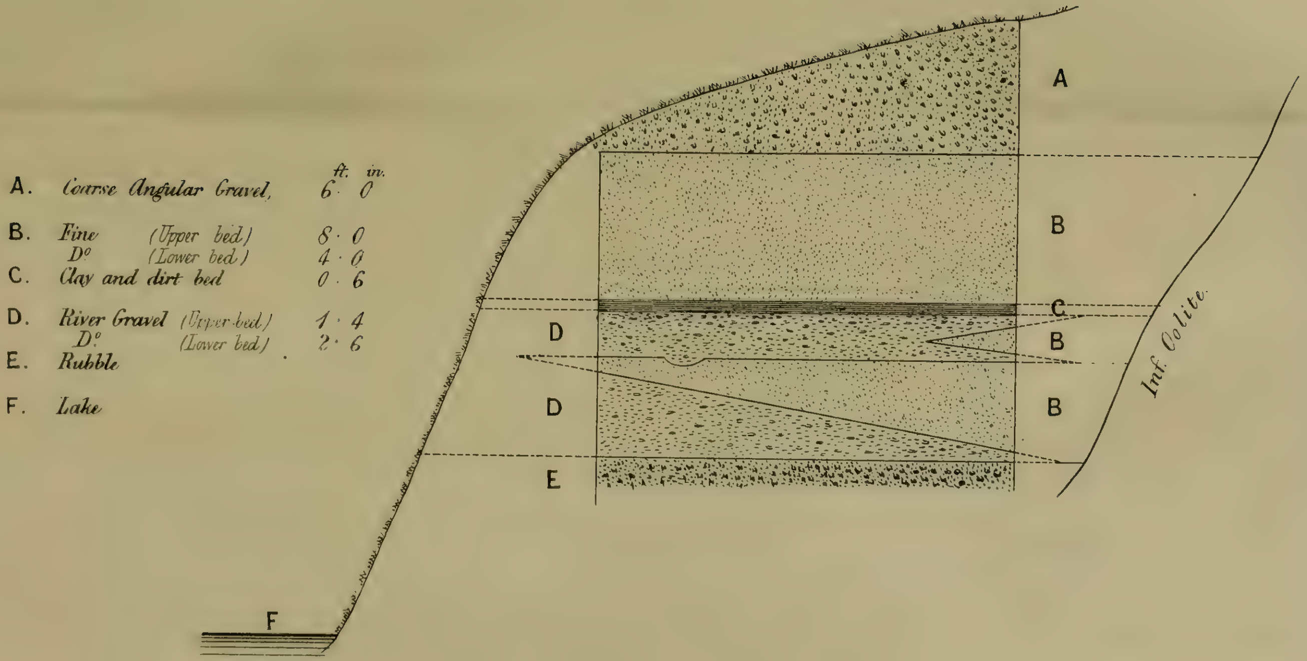
The "heaps of rubbish" alluded to in the above quotation from the "Geology of Cheltenham," are, in my opinion, due to the tumbling and slipping of masses of Inferior Oolite, which were afterwards disintegrated by frost, and converted into detritus, rather than to the action of storm waters, or to snow and land ice.

The suggestion in my own paper, so far at least as it relates to the age of the gravel, is not in accordance with more recently observed facts. For instance, at Longford's Lake, near Nailsworth, the Gravel pit which the Club examined on the occasion of the Meeting at Nailsworth in 1868, and to which attention was called by Mr. G. F. PLAYNE, showed the Angular Gravel *overlying* the river gravel, and therefore a more recent deposit; but the position of this gravel bed clearly proves that since its deposition the valley has been materially deepened. Since the visit of the Club the pit has been excavated to a greater depth, as shown in Fig. 1.

The position which the Gravel occupies varies according to the character of the slope on which it lies, and the formation from which it has been derived; thus, the Gravel from the Great Oolite, Stonesfield Slate, or Forest Marble is usually found deposited upon the Fuller's Earth, while that derived from the Inferior Oolite is sometimes found as described by Mr. Lucy, "running up to a point where the Combe rises at a considerable angle;" but it is by no means confined to the Combes: it may be generally seen along the slopes of the hills, and at various levels. Where the land is under cultivation, its presence may be readily detected. It may occupy the edge of an escarpment, or extend up to the ridge of a long spur. It may rest upon the Upper Lias in the steepest part of a slope, or fill up a hollow in the hill side, or lie in the bottom of the valleys.

At Hyde it has been derived from the Great Oolite and Forest Marble, and it forms the top of the Escarpment of the Inferior Oolite, as shown in the section (fig 2.) This deposit is stated by Dr. Lycett to be 16 feet thick. At Longfords Lake it is near the bottom of the valley, interstratified with river Gravel, the whole being 20 feet thick (fig. 1.) At Stroud it is on the slopes of the spur upon which the town is built, and varies in thickness from 1 to 4 feet. At Pitchcombe it is on the slope, but runs up to the ridge of the spur which forms the western side of the combe, and is in layers, some of which are mixed with earth, showing a succession of deposits, and possibly a change of conditions (fig. 3.) In Gatcombe Park, in an area of 5 or 6 acres there are five pits open at various levels, but as they are on Fuller's Earth, their present different positions may be owing to landslips. At Rodborough Hill, in an old water-course now dry, about 10 feet wide and 6 feet deep, in the south-west slope of the hill, and in the steepest part of the slope, the Gravel has been deposited to the depth of four feet, partly filling up the bed of the water-course. In the valleys of the Upper Cotteswolds which run southward, the Gravel is

Fig. 1. *Section of Gravel-Pit at Longfords Lake.*

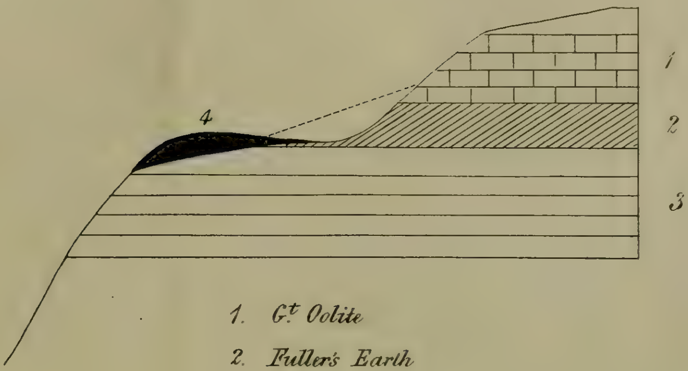


		ft.	in.
A.	*Coarse Angular Gravel,*	6 ·	0
B.	*Fine* *(Upper bed)*	8 ·	0
	D° *(Lower bed)*	4 ·	0
C.	*Clay and dirt bed*	0 ·	6
D.	*River Gravel* *(Upper bed)*	1 ·	4
	D° *(Lower bed)*	2 ·	6
E.	*Rubble*		
F.	*Lake*		

NATURAL HISTORY

Fig 2.

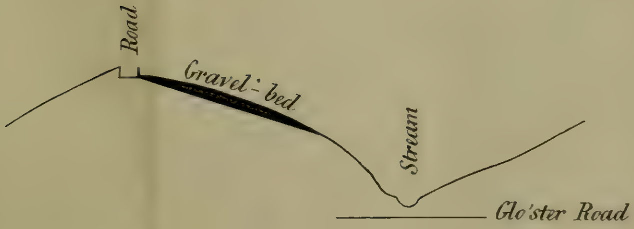
Gravel-Pit at Hyde House.



1. *G^{t} Oolite*
2. *Fuller's Earth*
3. *Inf. Oolite*
4. *Gravel-Bed*

Fig 3.

Gravel Bed at Pitchcombe.



NATURAL HIST

generally at the foot of the slope. It is unnecessary to refer to other than typical deposits; but the extent of these Gravels is considerable; probably there is not a valley in the Cotteswolds in which they do not occur, often forming a narrow belt along the hill side except where intersected or broken by a running stream or combe.

Mr. Lucy attributes the transport and deposit of the Gravel to the sliding of land ice and snow. I do not think this explanation is sufficient, for the following reasons :—

(1)—The detritus, if formed and carried down the slopes by land ice, would, to some extent, be worn and smoothed, but the Gravel has not any such appearance.

(2)—Where the Gravel is found near the ridge of a long spur, there could not have been any gathering ground for a sufficient accumulation of snow or ice to form sliding masses, and no detritus could be brought into such a position by moving ice.

(3)—At Hyde the Angular Gravel has been brought from the slope of the Great Oolite over the Fuller's Earth, the surface of which is nearly flat, and deposited on *the edge of the escarpment* of the Inferior Oolite, which has a steep slope immediately below. It is difficult to conceive how a mass of moving snow or ice could be arrested in its progress just at the spot where the incline became so much greater. Yet. if Mr. Lucy's explanation is correct, this must have happened year after year until a gravel bed of considerable thickness was deposited.

(4)—The deposits at Longfords Lake show no trace of ice action. If masses of ice came down the slope upon the Gravel bed, then in course of deposition, the regular arrangement of rolled and Angular Gravels, as seen in the section, would have been disturbed, and the two Gravels mixed up together. The ice would also have carried down whatever rubbish the frost had previously broken up, and we might expect to find the deposit made up of blocks of stone, varying in size, with Gravel and detritus generally, whereas it is a characteristic feature of the Gravel at Longfords, and generally elsewhere, that the particles are small and free from common rubble. This is, I think, suggestive of the periodical shelling off from the rock surfaces of thin flakes or fragments, which became still further pulverized before they were carried away to be deposited in the Gravel bed.

It is necessary, therefore, to consider in what other manner these Gravel beds may have been formed. I think it will be found that they are attributable to different conditions, and were deposited at different periods. The Gravel which lies immediately below the Freestone beds of the Inferior Oolite, where the slopes are always very steep, is, I think, merely detritus, which, having been previously loosened by frost, periodically fell from the rocks on the warm weather setting in, and which either rolled down the slope or was washed down by surface water. Its position is generally on the slope where the incline becomes less, and exactly where we should expect to find it, assuming that it had come down the hill in the way suggested.

But the Gravel which lies in irregular positions on the slope, at distances from the Oolite beds from which it has been derived which preclude the possibility of its having at once fallen on its place of deposit, and in positions similar to those shewn in the section at Hyde, is more difficult of explanation. I am of opinion that this is due to storm waters or surface drainage, which brought the detritus down the hill upon a frozen surface, and deposited it in those places where the frost usually disappeared in spring before it left the higher ground.

If we imagine a period when the severity of winter was much greater than at the present time; when the hills were for the most part bare of vegetation, and the oolitic rocks more exposed, there would be little or nothing to check the waste occasioned by frost and rain. The climate in spring was then probably as changeable as now. The snow that covered the ground in winter would first disappear in the valleys, but would remain on the hills and the upper part of the slopes, and the changes from frost to mild weather, and *vice versâ*, would, from the variable character of the climate, be frequent. As a necessary consequence, the upper part of the slopes would, during each succeeding spring, be more or less covered with ice, and the slippery surface would facilitate the washing down by the heavy rains of spring of the newly-formed detritus of the previous winter. The deposit would generally be along the line where the frozen snow ceased. This is not merely conjecture, inasmuch as the writer noticed during the frost of the winter of 1870, that a temporary thaw occurred, and the valleys below a certain well-defined line were cleared of snow. The frost again set in, and the snow which remained on the hills and the upper part of the slopes was again frozen, and so formed a snow-line along the side of the hills, very near the level at which the Angular Gravel is most abundant.

The age of this Gravel is, I think, nearly identical with that of the river Gravel. The intercalation of the Deposits at Longfords Lake shows that the Angular Gravel was being deposited at the time when the stream was either depositing or re-arranging the river Gravel, and before it had excavated the bottom of the valley to its present depth.

[*Fig.* 1. *Section of Gravel Pit at Longfords Lake.*]

The intercalation of the Angular and River Gravel in this section may be explained thus:—Angular Gravel was first deposited at the foot of the hill. It rested against the slope of the Inferior Oolite, and on the Rubbly Oolite (E.) This deposit accumulated while that of the River Gravel (D) was going on, but probably, by reason of the wash of the stream, a slip took place, and a mass of Angular Gravel (B) came down upon the River Gravel, and was spread over it by the stream, forming a well-defined bed, thinning out on the side next the channel. The deposition of River Gravel continued (D), partially interrupted by a second slip of Angular Gravel (B), but at length it ceased, and the thin stratum of clay and dirt (C) was formed upon it. After this the deposit of Angular Gravel (B) was continuous for a considerable period; the bed being 8 feet thick. This was succeeded by the coarse Angular Gravel (A). It is possible that the difference in the quality of the Gravels A and B, is due to a change of climate, the disintegration being less as the climate became milder. The upper Gravel bed may, therefore, be comparatively modern. The surface of the Lake is now about 20 feet below the bottom of the Gravel Pit.

[*Fig.* 2. *Gravel Pit at Hyde House.*]

The peculiar situation of this deposit has been already described. If we suppose an accumulation of snow to have taken place periodically in the angle formed by the steep face of the Great Oolite, and the comparatively level surface of the denuded Fuller's Earth, the spring rain, while it removed the snow elsewhere, would leave a considerable drift, as shown by the dotted line in the section, which becoming frozen, would form a slippery incline, down which the detritus from the Great Oolite would be easily carried by the surface water, to the site of the gravel beds below; while the disappearance of the snow lower down the hill would, by presenting a rougher surface, retard, if not wholly prevent, its further transport.

[*Fig.* 3. *Deposit of Gravel at Pitchcombe.*]

This must have taken place before the valley was worn down to its present depth. The gravel was probably brought down the Combe, and deposited at its junction with the Painswick valley. It was clearly not derived from the disintegration of the rocks forming the spur, inasmuch as in the upper part of the bed the gravel is on the top of the spur.

Sections might be multiplied, but the above examples are given by way of illustration of the various situations in which the Gravel is found, and the manner in which it has been deposited. It more generally occurs just below the base of the Freestone beds of the Inferior Oolite, where that formation has no capping of Great Oolite; but in other instances, it is more abundant upon the slopes of the Fuller's Earth.

The absence of organic remains, as well as vegetable mould, except in the upper and more recent deposits, points to a period of extreme cold, when the hills were bare and desolate, and the waste occasioned by sub-aerial influences was continuous and excessive. No surface soil is found beneath the gravel beds, the commencement of their formation, therefore, was before any depth of soil had accumulated on the slopes of the hills. The accumulation of Gravel appears to have been spread over a very long period, and having regard to the presence of land shells in the finer deposits of the River Gravel, it is probable that the formation of the Angular Gravel beds commenced before the River Gravel was re-arranged by the streams, and re-stratified. Perhaps the period to be assigned to its commencement is that of the re-current period of cold, during the latter part of the Glacial epoch. And it continued to form while the slopes remained exposed, and ceased only as vegetable matter began to cover up the surface.

On the Ancient Wall of Gloucester, and some Roman remains found in proximity to it, in 1873. *By* JOHN BELLOWS.

Eastgate House, Gloucester, stands on the north side of Eastgate Street, and occupies the site of the Castle which formerly defended one of the principal entrances to the city.

In the spring of 1873, whilst preparing to erect some buildings on the premises at the back of this house, I took the opportunity of making a cutting at right angles to the line of the road-way, with a view to discovering remains of the city wall, should any such exist, under the surface. On the southern side of Eastgate Street a portion of this wall had been removed in sinking the foundation of the Co-operative Stores; and further on between Brunswick Road and Constitution Walk, a still larger mass of it was taken away to make room for the School of Art. Some of the stones from the latter spot now form the monument which has been placed on the battle-ground at Barber's bridge, since the publication of Capt. Price's paper in the proceedings of the Club for 1872.

With the assistance of J. D. T. NIBLETT, to whose acquaintance with our local Antiquities the Cotteswold Club has been so often indebted, I opened the ground at a point about 14 feet from the side of King Street, and 100 feet back from Eastgate; and in the course of two hours had the satisfaction of laying bare a part of the mass of masonry, which several members of the Club may remember seeing on the afternoon of the Annual Meeting, when some pieces of pottery and other articles found in the excavation, were also offered to their inspection.

So fresh was the appearance of the masonry, uncovered for the first time after the lapse of centuries, that some of those who examined it, expressed doubts as to the possibility of its being Roman: but as I have since that time laid it open along

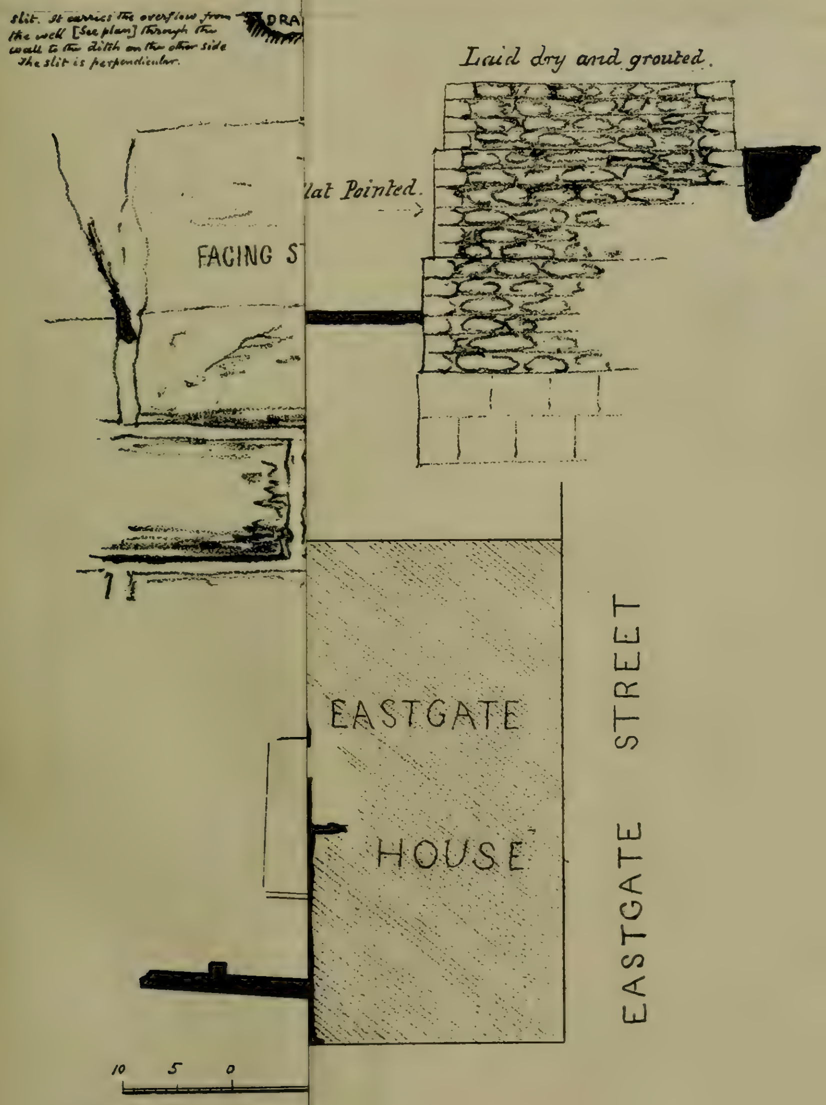
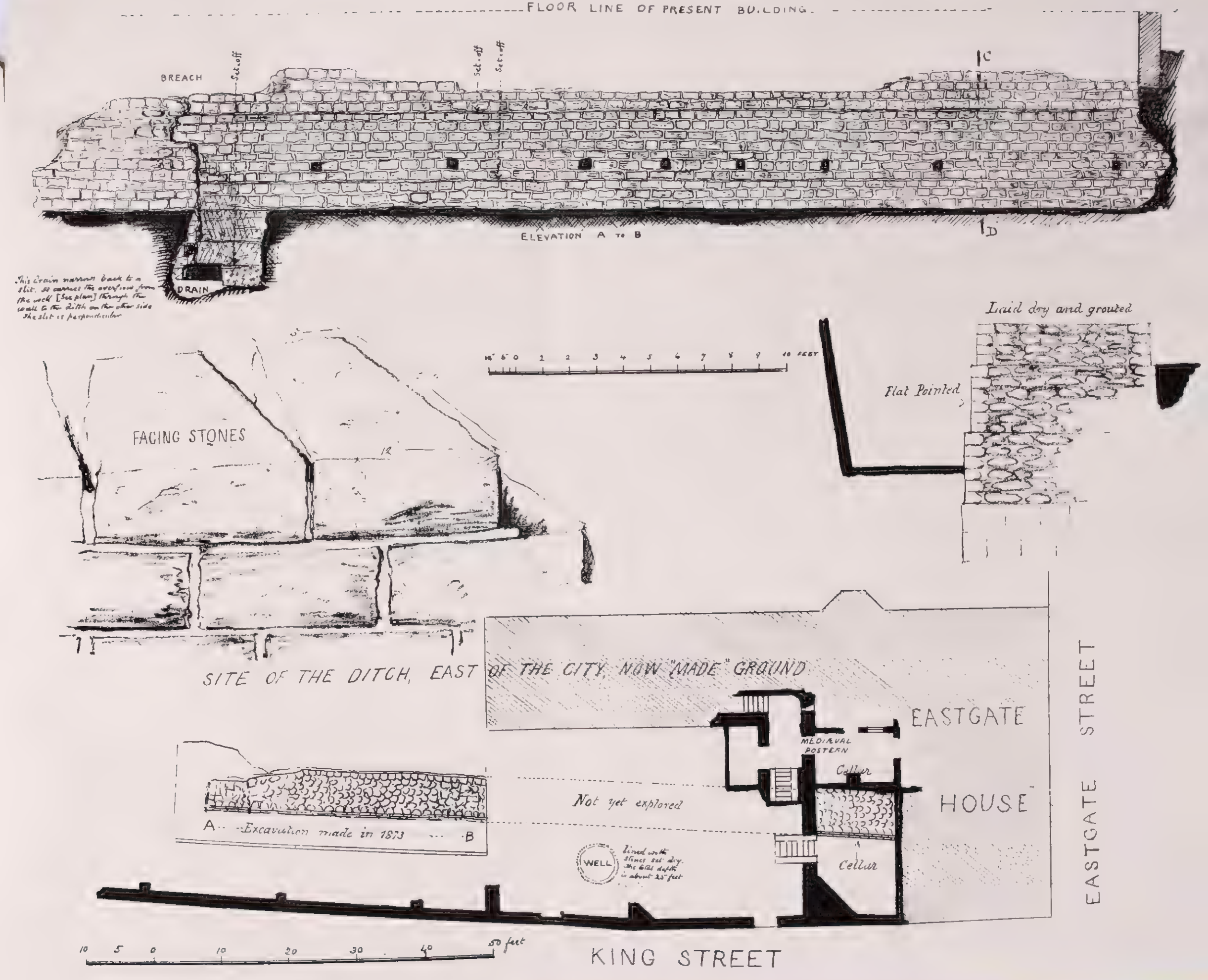

slit. It carries the overflow from the well [See plan] through the wall to the ditch on the other side
The slit is perpendicular.
DRA
Laid dry and grouted.
lat Pointed.
FACING S
EASTGATE HOUSE
EASTGATE STREET
10
5
0

PLATE I.

PART OF THE CITY WALL OF GLOUCESTER,

ADJOINING THE EAST GATE.


FLOOR LINE OF PRESENT BUILDING.
BREACH
Set-off
Set-off
Set-off
C
D
ELEVATION A to B
DRAIN
This drain narrows back to a slit. It carries the overflow from the well [See plan] through the wall to the ditch on the other side. The slit is perpendicular
Laid dry and grouted
Flat Pointed
12' 6 0 1 2 3 4 5 6 7 8 9 10 FEET
FACING STONES
12
SITE OF THE DITCH, EAST OF THE CITY, NOW "MADE" GROUND
EASTGATE
MEDIÆVAL POSTERN
Cellar
HOUSE
Not yet explored
A Excavation made in 1873 B
WELL
Lined with stones set dry. The total depth is about 25 feet
Cellar
EASTGATE STREET
KING STREET
10 5 0 10 20 30 40 50 feet

a total length of forty-five feet, and collected some further details in reference to it, I hope to produce tolerably clear proof that it is really a portion of the *Roman* wall of Gloucester.

(To enable the reader more readily to follow the details, our colleague, J. P. MOORE, has kindly made the accompanying sketches.)

That so little of the wall remains at the present day in any part of the city, is readily accounted for from the fact that CHARLES II. issued an order permitting all comers to cart away the stone for private uses, with a view of ensuring the destruction of the fortifications which had been used to withstand his father's forces during the siege. With such a valuable quarry at everybody's disposal, the only chance that could preserve any portion of the structure was, that, here and there other buildings were connected with it in such a way as to make the removal of these parts impossible. The Castle at the East Gate, and its adjoining premises belonged, until long after CHARLES THE SECOND's time, to the Corporation, who used it as a House of Detention; and it is probable that to this circumstance we owe the preservation of this part of the wall.

That Gloucester was strongly walled during the Roman occupation of Britain, its status as a Colony would alone prove; all the Colonies having been thus fortified after the massacre of the ninth legion at Camalodunum by Boadicea.

That Gloucester *was* a Colony, is known from the inscription found at Bath, commemorative of a Decurion of "COLONIA Glevum." Similar inscriptions of soldiers of the sixth legion, speak of York as a Colony; and one, connected with the second legion, indicates the same of Caerleon.

It is generally admitted that the Saxons made no change in the Roman Cities, but handed them over to the Normans, in the state in which they found them. When we consider the tens of thousands of tons of stone required to surround the city with a wall, from 5 to 9 feet in thickness, and five and twenty feet in height, it is scarcely necessary to ask whether it is likely that all this mass would have been cleared away by either Saxon or Norman, for the simple purpose of re-building it. That its upper portion had undergone many changes and repairs, and much re-building, in the course of eight or ten centuries, is of course probable; but we are now dealing with a part of it which, for a very long period, has been below the level of the streets, covered up from the action of the weather, and therefore preserved from wear and tear.

Roman Gloucester shows a level, in many parts, of more than 8 feet below the present streets. The same difference, I believe, holds good at Cirencester, Wroxeter, and many other Roman Stations in Britain. Where a town has been repeatedly besieged or burned, the rise of ground has been more rapid. In some parts of London, Lincoln, and York, for example, it is more than double as much as here. In Rome itself, going back to a more remote date, the rise is more than 50 feet; and in Jerusalem, the accumulation of 40 centuries, is marked by an increment of over 200 feet. It is not very easy to account for this; yet nothing is more evident than the steady upward progression of our streets, at the present day. Many of the older houses in the lower part of the city, are now entered by a step *down* from the street, instead of *up*: and at the Blue Coat School, where the date of the re-building (1807) serves as a mark, we see the new flags that have just been placed in front, stand an inch or more above the old ones (some of which could not be removed, on account of the iron railings let into them,) notwithstanding that the city surveyor has kept this new part almost down to the level of the carriage way—to "humour" the difference. Had he not done so, the real rise would be seen to amount to several inches, in this interval of less than three quarters of a century. It is worthy of remark, that this increment varies in different parts of Gloucester. In Aldate St. near the North Gate, it has been excessive; the sudden fall in passing down the last 50 yards, and especially at the site of the gateway, is the result of this. If I may hazard a guess *why* this rise should have been more on the *north* side than on the others, I would suggest that from its leading in from the CIRENCESTER road (the approach from which is circuitous), it was the Gate at which a besieging force from that town would *first* arrive. If the Saxons took the three towns of Bath, Cirencester, and Gloucester in the order in which I name them: they reached the North Gate of the city first. The destruction of this Gate and buildings adjoining it would account for some of the difference in the rise of the street at this point: whilst part of the fall outside is due to the natural formation of the ground.

In the accompanying plan, the present level of the street is slightly below that of the dotted line showing the floor.

All along the trench I have excavated, lay a bank of fine earth, containing quantities of either charcoal, or wood so far carbonized by time as to be indistinguishable from it, together with oyster and mussel shells, snail shells, (only the common *helix aspersa,*) bones of fowls, sheep, pigs, red deer, and oxen, some of the latter being *bos longifrons;* besides a great variety of articles made of bone, such as counters used in some game, a spoon, a number of pins, and some large needles or bodkins. All these are as well preserved as if they had been placed in their rather damp bed only a few hours before they were found. The points of the pins and needles are perfectly sharp, and on some of them are distinguishable the marks of a fine file used in finishing them. Many of the marrow-bones are split *lengthways.*

Oyster shells are almost always turned up where there are Roman remains in Britain. I have found two principal heaps, of which one, farthest from the Gateway itself, consisted entirely of large coarse shells like those of the largest Mumble Oysters: whilst the other which lay nearer the Gate, was wholly composed of small "native" or Colchester shells. A visitor who was lately examining the ground expressed some surprise that the Romans should have had means of conveyance sufficiently rapid to bring oysters fresh from Colchester to Gloucester; but we must bear in mind that they had not only a magnificent line of road between these two cities, but a posting service of such excellence that a government messenger could travel over it at the rate of a hundred miles a day. At every five or six miles there was a station at which forty horses were kept for the express service only; and although none of these were allowed to be used for private or commercial purposes, we may be certain that the means of conveyance for every description of provisions for the officers in the great stations would be of commensurate efficiency. Oysters were conveyed from the east coast of Britain to Rome itself; for JUVENAL mentions Richborough Oysters as figuring among the luxuries of the imperial city. I take it, of course, that the "native" Oysters whose shells lay in the one heap, had been used by the superior officers, and the Mumbles by those of narrower means.

The bones of both sheep and oxen, in the waste heap, all indicate *small breeds*. Cotteswold mutton of the Roman period must have been pretty much what the Welsh is now—or that of the Dorset sheep, of which I have heard a southern farmer speak as the "old original British" sort. A Cotteswold farmer somewhat contemptuously remarked of these representatives of the ancient ovine species—"But what *be* um? Thay be nothin but *moice*."

TACITUS mentions, in his "Manners of the Germans," that their land was "well stocked with cattle, but of an under size:" and in his "Annals" he has a passage so curiously confirmatory of the small size of domestic oxen in Friesland, that I must ask leave to give it entire:—

"In the course of this year the Frisians, a people dwelling beyond the Rhine, broke out into open acts of hostility. The cause of the insurrection was not the restless spirit of a nation impatient of the yoke; they were driven to despair by Roman avarice. A moderate tribute, such as suited the poverty of the people, consisting of raw hides for the use of the legions, had been foremerly imposed by DRUSUS. To specify the exact size and quality of the hides was an idea that never entered into the head of any man, till OLENNIUS, the first centurion of a legion, being appointed governor over the Frisians, collected a quantity of the hides of forest bulls, and made them the standard both of weight and dimension. To any other nation this would have been a grievous burthen, but was altogether impracticable in Germany, where the cattle, running wild in large tracts of forest, are of prodigious size, while the breed of domestic uses is remarkably small. The Frisians groaned under this oppressive demand. They gave up first their cattle, next their lands; and finally were obliged to see their wives and children carried into slavery by way of commutation. Discontent and bitter resentment filled the breasts of injured men. They applied for redress, but without effect. In despair they took up arms; they seized the tax-

> gatherers, and hung them upon gibbets. Olennius made his escape. He fled for refuge to a castle known by the name of Flevum, at that time garrisoned by a strong party of Romans and auxiliaries, who were stationed in that quarter for the defence of the country bordering on the German Ocean." (Annals, Book iv. lxxii.).

This led to a very bloody war, in which the Roman power in northern Germany was shaken to its foundations; the legions being again and again beaten, and on one occasion a body of nine hundred Romans cut to pieces to the last man.

Other articles found are—

I. Some loose tesseræ, rounded with wear on the upper sides, and evidently thrown away with rubbish, from repairing a house; also some unused mortar, and pieces of wall plaster with coloring of dull red, buff, and green, similar to those found in Roman houses at Cirencester. This mortar is very friable and inferior in quality to that used in the wall of the city.

The tesselated pavement was, at the beginning of the empire, a mark of the *official* quarters of a Roman General. It would seem, indeed, to have been made use of as an emblem of the permanent conquest of the spot on which his tent was pitched; somewhat as we now annex a newly discovered island by planting the British flag; for Suetonius (himself a Prætorian tribune, or in modern phrase, a colonel in the Guards), states that the materials for making tesselated pavement always formed part of the baggage of a Roman General on the march. (*Life of* Julius Cæsar.)

II. Two pieces of Cornish Malachite Copper, evidently kept as curiosities: as they are not cut or shaped in any way.

A rounded ball of flint, with some artificial indentations round the centre, as if for placing the finger tips; about 1¾ inches diameter.

III. Small articles of Bronze, &c. A little stand, about 2 ins. square; a needle, 6 ins. in length, the eye of which is formed by beating one end flat and cutting a slit in it with a chisel; the shank is round, but squared or four-sided towards the point.

A fibula with its spring and catch, perfect when raised, but broken by handling it too soon after being exposed to the air.

I do not know whether I am correct; but many of the articles of metal certainly appeared to be more brittle when found, than they were a short time after exposure.

The hasp of a cabinet lock, shaped like an elongated leaf, made of bronze inlaid with enamel. This is the precise counterpart of one found at Richborough, now in Roach Smith's collection, and which is figured in Wright's *Celt, Roman, and Saxon.*

A copper armlet, about 2 inches in diameter and ¼ in. thick, broken by the labourer who took it up, handling it too roughly.

A spout of some small vessel; and one or two other fragments.

The only coin I have yet found was lying on the top of the wall, (*i.e.* on its broken surface) It is about the size of a farthing, but much thicker, and so heavy that the labourer who handed it me thought it was gold. It is, however, a copper coin, but much oxydized; the outline of a head with a long neck is traceable on it, with the letters A V G. On the edge are two deep notches, apparently hacked with a knife, but filled with verdigris: shewing that it had been picked up by some labourer engaged in removing the upper portion of the wall, examined in a rough and ready way, probably in the hope of finding it to be what my man had supposed it; and then cast away. Roman copper coins were not likely to be much appreciated by a labourer of Charles the Second's time. A "third brass" coin of Constantine, was found some years ago, in digging the foundation of the Co-operative Stores.

A fragment of Alabaster 6 inches in length, turned in a lathe and which may have served as a spout for a fountain. (?)

IV. Of iron or steel, a number of articles appear to have existed, which the damp has destroyed; their presence being indicated by masses of oxide. Besides these there were, however, a number of broad-headed nails, about 3 inches long; a piece shaped like a T, somewhat like the tethering pins for cavalry horses which have been found near Blandford;* and the end of a legionary sword blade, 6 inches in length, and 1½ inch in breadth, tapering to 1 inch. I say a legionary sword, because this weapon had a short, very stiff blade; and the fragment is certainly part of such a blade. The swords of the *Auxiliary* soldiers were of various shapes, as they were suffered to retain their own national weapons. The cohort of Dacians, for example, on Hadrian's wall, used curved swords, one of which is figured on a tomb-stone found at their station of Amboglanna, now Birdoswald, near Carlisle; as well as on the Trajan column at Rome. (*See* Bruce's *Roman Wall.*) The Roman soldiers depended more on stabbing than cutting, as inflicting more dangerous wounds. The swords of the northern nations of Europe are all *long-bladed;* as, for example, the claymore of the Caledonians, and the long sword of the Norsemen. The southern nations, Spaniards, Italians, and Greeks, to the present day usually fight by *stabbing;* and the bayonet of modern warfare, as the reader will remember, is said to take its name from the town in which it was invented, at the foot of the Pyrennees. Although there is no *evidence* of this, it certainly reached this country from France.

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* These pins have a ring on the top of the cross bar, ☥ for fastening the halter to. It is curious that the emblem of the shepherd kings, as shown on some of the Ancient Egyptian tombs, is of the same shape.

V. A soldier's whetstone, shaped like an A with a hole drilled through the upper corner, by which to suspend it from the belt. It bears marks of considerable service, shewing not only a hollowing of the sides from sharpening knives, &c., but notches made by removing the "wire edge." Professor Church, who kindly assisted me during part of the excavation, at once identified this stone as the counterpart of one found with Roman remains at Cirencester, and now in the museum of that town.

I also found a small hone of very hard fine black stone: a flattish water-worn pebble, about 2 by 1 inch, which bears on one of its surfaces the bright sheen of bronze, from the sharpening of a pin on it. It owes this singular freshness to the accident of its having been surrounded by a few handfulls of potter's clay, which had kept it perfectly air-tight. A good deal of this pottery-earth lay scattered among the other soil. So perfect is the preservation of any object that happens to have been cased with clay, that the late W. Arkell of this city, found a horse-shoe some years ago in Northgate Street, in a lump of clay, absolutely fresh as it left the Roman forge, with the hammer marks on it, and free from even a speck of rust. In one of these little chance accumulations of potters' earth, I found the broken shell of an egg, with the yellow still bright on it: but after an hour's exposure to the atmosphere the colour faded entirely away, and the whole crumbled to pieces.

VI. Of fine White Glass, the most expensive sort used by the Romans, I have found a considerable quantity. The long lapse of time has decomposed the surface, which sometimes presents a beautiful silvery appearance, and with every variety of iridescense, from the detachment of the thin silicious plates. The fragments are mostly feet of vases, or similar vessels, and necks of bottles with elongated lips. One part of a little goblet is spirally striped with a pinkish hue; it resembles a small claret glass, with a stem of about a quarter of an inch, between the bowl and the foot, but it is much thinner than a wine glass of the present day.

Two bottle-necks deserve a word in passing, from a contrivance in their shape to enable the user to drop a fluid with greater precision than would be possible with our phial bottles of the present day. They have each a long projecting lip, in the middle of which is a slight protuberance, made by pressing the end of a square wire up against the *under* side of the lip while the glass was red hot. This makes a slight impediment in the pouring, so that the drops could be separately counted. Some of my visitors have spoken of these vessels as "lachrymatories;" but it seems more probable that they were *perfume bottles*, inasmuch as the Romans were far more given to make other people cry, than to shed tears into bottles on their own account. On the other hand, perfumes were not only used on the person, but added to wine, sometimes to the very serious enhancement of its cost; as hinted in one of Martial's epigrams in which two men are talking of giving a wine party, when one of them offers to pay for the *wine* if his friend will provide the *perfume*.

There is also a long neck of a little vase, made of red-ware, without a lip; and this is the sort of vessel in which unguents were kept, and used from, by inserting a bronze instrument not unlike a small marrow-scoop. There is one of these scoops or *lingulæ* in the ARKELL COLLECTION, lately added to our local museum, which was, I think, found at Kingsholm. When it was required to use the whole contents of such a vase at once, it was broken; and it is a vessel of this description which is translated in our Testaments as the "alabaster box" of very precious ointment, used by MARY MAGDALENE in anointing the feet of CHRIST. The most expensive perfumes were always kept in alabaster, from an idea, whether correct or not, that it had the property of retaining the odour better than any other material. JUDAS complained that the alabaster vase and its contents were worth three hundred pence; a sum I suspect practically equal to more than £20 of the present day.

Several pieces of a greenish window glass, but very uneven in thickness, also occur; also the half of a large striped bead, such as are frequently found in Roman Stations; and a round button core of glass slag; a kind often found in Roman coffins, having probably served as shroud buttons; for the Romans buried some of their dead, while they burned others.

I pass over some other objects to come to the TILES AND POTTERY, of which I have found more than a thousand fragments, and with which part of the soil *below* the excavation is still thickly studded. They may be briefly classed as follows:—

1. A diamond or lozenged-shaped stone tile, with a large hole in the upper corner for a nail. Similar tiles, but hexagonal, have been found at Uriconium, as well as the nails *in situ*, by which they were fastened. This tile is of Stonesfield slate.

2. Broken slabs of red sandstone, ¾ inch thick, much smoke and charcoal-stained, which have been used for covering flues in hypocausts.

3. Flue tiles; very thick, and flanged.

4. Broken pieces of Roman brick, 1¼ to 1½ inch thick.

5. Pieces of a large Amphora. These vessels terminated in a sharp point, instead of a flat bottom; possibly for placing them in sand or clay forming the floor of the cellar, so as to keep the temperature of the contents more equable.

6. Fragments of common ware made of Cranham clay. One

of these, an exquisitely turned curve forming part of the mouth of a vase, is little more than sun-burned. This may possibly indicate that the pottery was made in, or very close to, the city itself; as they would hardly bring it in an unfinished state from a distance.

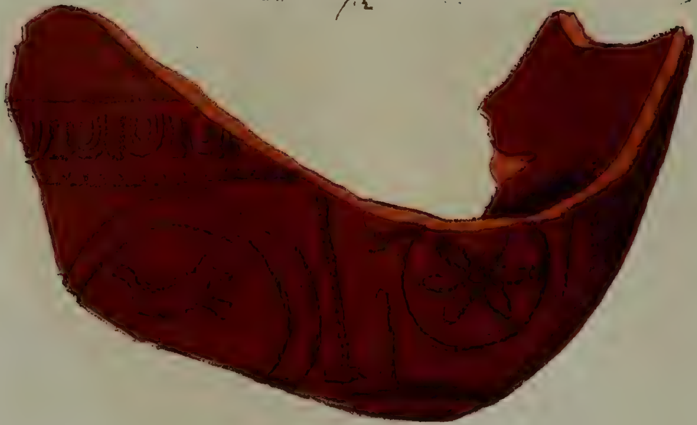
7. A number of jar-necks with handles attached, and other parts of the same vessels, of a coarse ware, dark coloured inside, but lightened on the surface to a cream colour by the burning. These handles are invariably deeply grooved down the middle, thus affording a better hold for the ball of the thumb in pouring, than is the case with similar vessels made now.

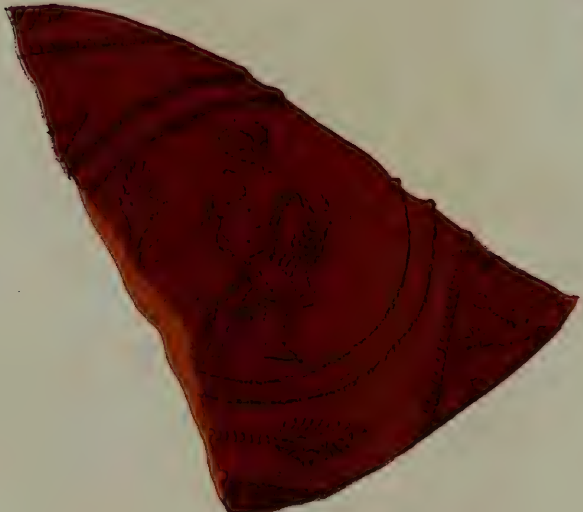
These common bottles were often stopped with a bit of sponge, which could be used to *suck* the fluid from, if a small quantity only were required. The sponge used by the Centurion to give the vinegar to our Saviour on the cross was doubtless one of these bottle-sponges.

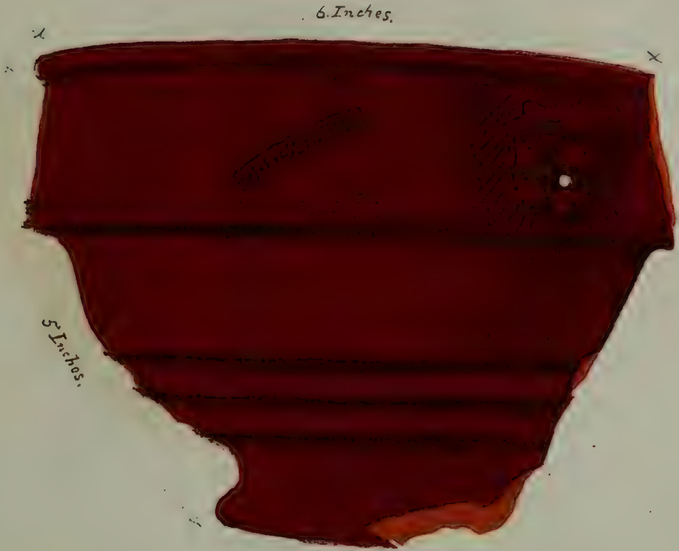
8. A great abundance of the common black pottery made at the Upchurch marshes in Kent. Most of the pieces bear a coarse wattled or basket-pattern on the outer side, made by drawing a stick across it in opposite directions. It would appear as though this pattern had come down traditionally from the earliest ages, when a basket lined with clay was used for carrying water. The removal of the basket-work would of course leave the marks as a pattern on the vessel; and these marks have been simply imitated, from one generation to another. The scale on which the Romans worked the Upchurch marshes must have been gigantic, as the broken débris extends over an area of many miles; in some parts to a depth of two or three feet. The ware was probably exported as well as used for home consumption. The only *perfect* article of Upchurch pottery I have found is a little jar or vase, about 4½ inches high. It has a notch on each side of the rim, for attaching a string or wire by way of handle; and the marks of fire *whitening* its sides, shew that it has been used for boiling. From its size it may have served as an egg saucepan.

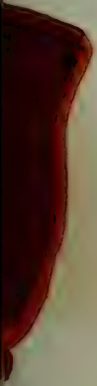
9. Fragments of a bowl of whitish clay, having on its rim spots put on with the tip of the finger dipped in a "slip" of red clay. This ware was made in in the New Forest.

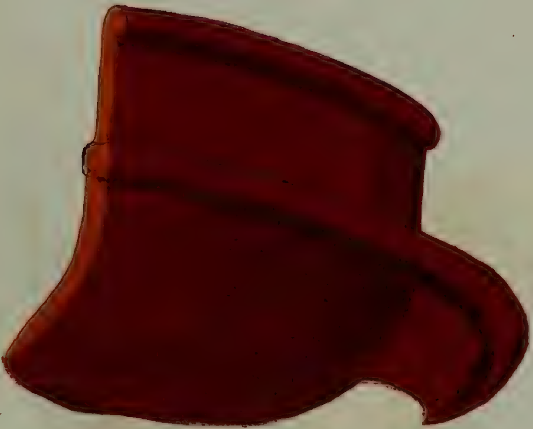
8½ Inches.
7½






6. Inches.
5 Inches.





J. P. Mann. Atc S.T. Del et Lith
1, Brunswick Pl. Glasgow.

BRITISH MUSEUM

10. A piece of ware made of fine white clay, faced with a dull blue or olive colour, and having on its surface the figure of a hare, with a bordering of detached points, "appliqués" in high relief. The salient points, of the ornament are wiped clear of the colouring, which produces a very good effect. One or two other pieces have a sort of dark copper-coloured facing, and are ornamented by indentations on the surface. These appear to have come from Durobrivæ, (Castor in Northamptonshire) where the Roman works extended over many miles.

11. The fine foreign ware called "Samian."* A great quantity of this beautiful material occurs in the waste heap; some of the fragments bearing figures of animals or birds, and some those of Hercules, Venus, and other deities. The mouldings are almost all of the "egg and tongue" pattern, and some pieces are ornamented with the beautiful pointed honeysuckle leaf, which may almost be called the Roman *"trade-mark."* Six of the fragments bear potters' names.

Among the pieces of Samian ware are portions of two *Mortaria*; vessels with quartz imbedded in the bottom, to afford a rough surface for triturating or mashing vegetables. They are *kitchen* utensils, and are ordinarily made of coarse clay.

I have also a portion of a statuette of Venus Anadyomene, made of pipe-clay, not unlike Parian in appearance. Professor Church identifies it as made in the same mould with one discovered at Cirencester. They were manufactured in Gaul.

These pieces of earthenware make but a dull list on paper; yet they have a poetry of their own, which refuses to be either numbered or catalogued. Time has done for them, figuratively, just what it effects with the bits of buried window-glass, which the decay of eighteen centuries has covered with silver and gold and all beautiful colours of the rainbow. These Samian vases, these bottles of perfume, were common-place realities to the men and women who lived when they were yet unbroken; and must have cost tears to the classical maiden, or provoked maledictions from the soldier or the slave, who were unlucky enough to let them fall. But to us their associations are purely ideal, for they bring down a faint echo almost from the days when our fathers paid tribute to CÆSAR, and when the laws of Rome, and the Latin language, moulded the every-day life of this Vale of the Severn where we now treat of them as curiosities of the past.

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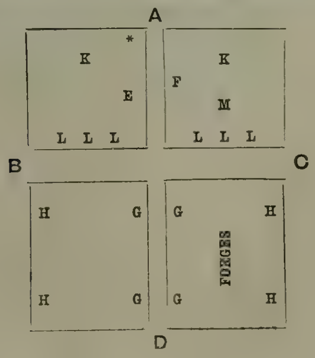
* Made in several parts of the Continent. Some of the kilns have been discovered in the Vosges. By an amusing affectation, antiquaries usually seem to consider themselves bound to say that the word *"Samian"* is inappropriate. They might with as good reason quibble at the term *"China"* as inapplicable to ware made at Worcester or at Sèvres!

It would be easy to go into further details with regard to the articles turned up by the wall at the EAST GATE of GLOUCESTER; but space will not admit of it, and I pass on to the question, *Why should these articles be found in this particular part of the city?* Samian ware is very rarely, I might say *never*, found more than a hundred feet *west* of the CROSS; though common black pottery and other Roman remains are frequently met with beyond this limit.

The fact may be clearly accounted for by a comparison of the lines of our principal streets with those of a Polybian Camp. In the early days of the Roman Empire the plan of the camp was uniform in every time and place; so that soldiers drafted to the most distant part of the world instantly knew their quarters and the post of every officer under whom they had to serve: very much as under the old system in the British navy a seaman removed from one ship to another, knew by his number both his place and duties; instead of, as at present, only knowing how to sink the vessel in case of fog.

The Polybian Camp for a single legion was very nearly a square bisected by two principal ways through it, and arranged thus:—



Anyone who is acquainted with the city of GLOUCESTER, will see at a glance that the line A D corresponds exactly with Eastgate and Westgate Streets; and B C with Northgate and Southgate Streets. In the Roman Camp E is the quarter of the General* (the Prætorium), F the Forum, or Market, and L L L L L L the posts of the Tribunes. The Tribune answers to the Colonel of a modern regiment. M the quarters of the Legati, or, as they would now be called, the two Lieutenant-Generals of the Army Corps.

Now where the Pretorium stands in the Polybian Camp (from E to the Cross) the corresponding site begins in the City of Gloucester with the Blue Coat School, and ends at the Cross. Along this line have been discovered, from 1807 to 1865, lines of tesselated pavement running under the present Blue School, and HOLMES's and MARGARET's shops. Part of one of these floors was removed to BOND's nursery ground; but I fear the rest has been destroyed. Another beautiful pavement was found some years ago at the back of the Crypt School, at the spot marked M in the Camp; and this is preserved in the bonded wine cellar occupied by WATSON and Co.

Now, looking at the extent of these pavements, and their position, it is impossible to doubt that they mark the sites of public buildings. The Quæstor (Paymaster) had his quarters at the back of the Prætorium; and all the *superior* officers in fact were lodged in the General's end of the Camp. The Gate, which reckoned as the chief one, and which was known as the Porta Decumana, always stood farthest from the enemy: and as the enemy here must have been the Silures in Wales, we see *why* the common soldiers had their quarters in WESTGATE Street. More than this, the cavalry had their quarters *behind* the infantry on each side of the street leading to the Porta Prætoria (our *West* Gate); and, exactly in accordance with this, the *forges* of the farriers have been found *behind* G (*i.e.*, between G and H) in Longsmith Street and Bearland, in Gloucester.

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* Vespasian, who was afterwards Emperor, was General, and his brother Sabinus Lieutenant-General, of the Second Augustan Legion, when that force conquered the south of Britain, inclusive of the Cotteswold district.

One can readily see that even after the military, or purely garrison, state of the Roman city began to blend with a civil status (for at the outset it was a garrison *only*—the civil population occupying KINGSHOLM,) the upper part of the town, with its great government offices, &c., would still remain the fashionable part. Roman houses, as the reader knows, were usually built round large court yards, like that of PANSA in Pompeii; and as these courts extended *back* 100 feet or so from the street, we have the reason why Samian pottery is found as far as 100 feet west of the Cross, but no farther.

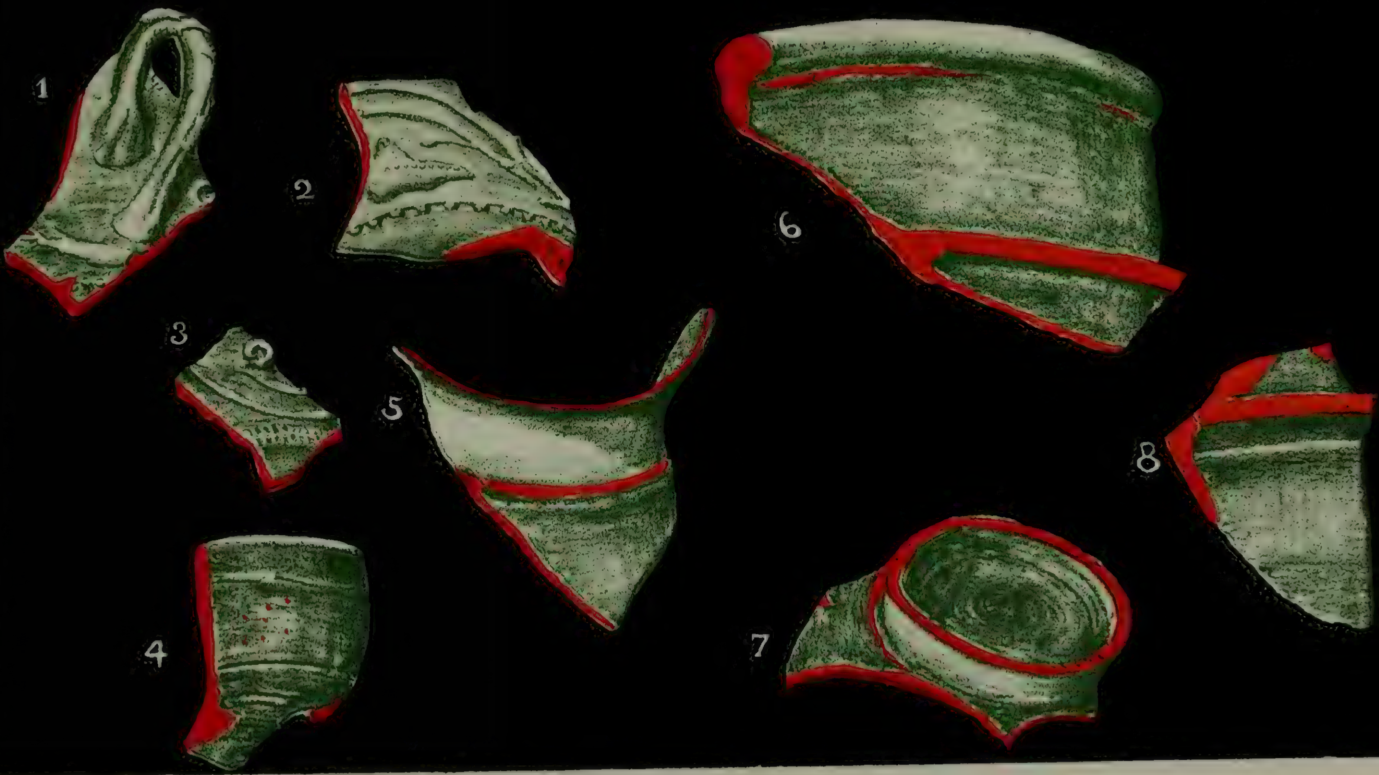
If the reader will look at the pottery in Plate III he will see that it is of a very expensive sort—the finest Samian, covered with a silver lustre. C. NEWTON, of the British Museum, informs me this ware is of the second century. There is another article which is worthy of special attention, and that is the fragment of a mortarium of the very finest Samian, shown in fig. II As already stated, a mortarium is really a *kitchen* utensil; they are usually found of very coarse material. There is a small portion of one in the Museum at CAERLEON, very similar to mine, but not quite so fine in quality.

Fine *white* glass (the costliest made), silver-lustered ware, *Samian* utensils for kitchen use, bronze cabinet-hasps, inlaid with enamel, and, may I add, *native* oysters, are unmistakeable indications of wealth on the part of their purchasers; just as the finest porcelain and articles of similar class at the present day indicate that those who indulge in them care little whether the income tax is sixpence in the pound, or twopence.

The reason, then, for these articles being found against the wall by the EAST Gate is, because the Decuman Gate lay next the *officers'* quarters, and this became the waste-heap for their houses.

The word *Decuman* has been a riddle to writers on Roman castrametation. Some derive it from its being next the quarters of the *tenth* cohort; the only objection to which is that at the time the name was given, *all* the cohorts were placed at the other end of the Camp. General ROY, in his "Military Antiquities of the Romans in Britain," suggests that it may have

PLATE III



BRITISH MUSEUM NATURAL HISTORY

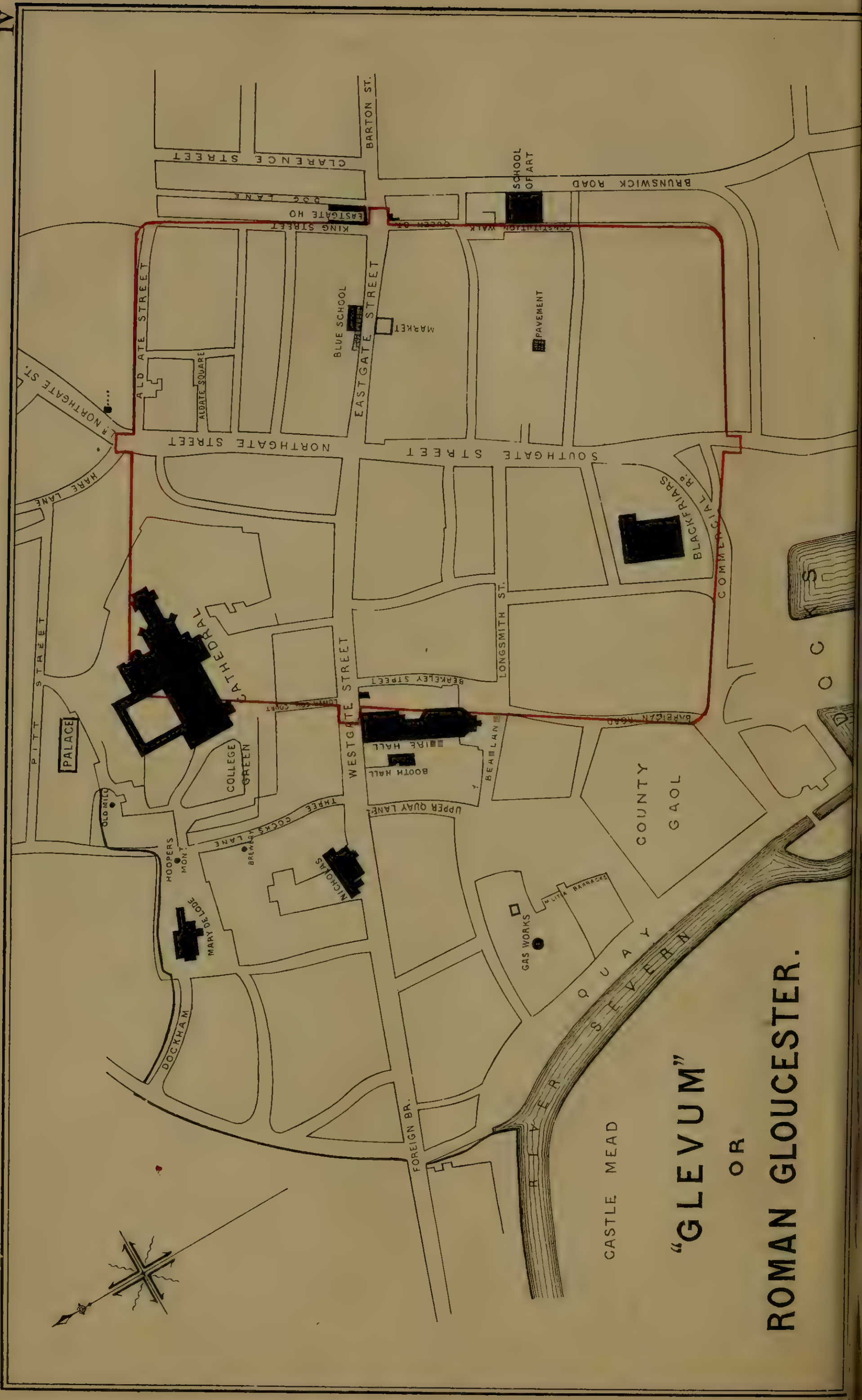
meant the gate through which the men were led who had to suffer decimation: but this punishment was of far too rare occurrence to favour such a supposition. I believe the real clue to it may be found in CICERO's "Orations against VERRES," by statements in which we see that the Romans made their tributaries pay a *tenth* of all their farm produce. The Decuman Gate was that by which the corn, cattle, and other stores were brought into the Camp; and as these things were known as tenths or tithings, it seems probable that the Gate was thence called the Tithing Gate. It may be remembered that the Romans requisitioned the Britons *in kind;* for one of the complaints against their rule was, that they often compelled the people to go to distant places to buy corn for the garrisons, in order to make them pay dearer for it, to the profit of this or that official, instead of letting them purchase it near the spot where it had to be delivered to the troops. CAMDEN considers that some of the earlier British coins stamped with an ear of barley, a pig, or a horse, were struck as tokens for a given *quantity* of barley, for the *value* of the pig, or of the horse, &c., which was required as tax at given periods.

The reader will, I believe, admit that the details I have already given are sufficient to show that the masonry in question is really part of the *Roman* wall of Gloucester.

After the discovery at Eastgate, I endeavoured to trace the whole lines of the quadrangle; at first, thanks to the effect of CHARLES II's edict, with but small success. I had this clue, however, that *if* enough of the Roman walls existed to be traceable, they would in all probability accord in some of their measurements with those of other Roman stations. Comparing plans of York and Lincoln, both of them "Colonies," and therefore walled cities of the first rank—(Lincoln is a contraction of "*Lin* dum *Col* o *n* ia")—in their earliest state, each of these cities measured about 1200 feet by 1300. Now the angle from the East Gate round to the North Gate is tolerably perfect; and I found, on experimenting, that the distance from either of these gateways to the *corner* of King Street and Aldate Street was pretty nearly 600 Roman feet. Here was *half* the base line of

1200 feet in one direction; and measuring 1300 feet at right angles to this I thought ought to bring me to the western boundary of the Roman city. This line came a little above Berkeley Street; but I could find no indications of a wall ever having existed at this point. I did succeed, however, in tracing its course along the northern and southern sides for a considerable distance, as well as the whole eastern front; and reporting this to the Director General of the Ordnance Survey, he ordered Captain HILL, the chief of the Staff of Royal Engineers at Bristol, to come to Gloucester, and accompany me over the entire line, as far as I had traced it, with a view to its being duly mapped in the next Survey of the city. The day before Captain HILL came to Gloucester for this purpose, I made one more examination of the part of Westgate Street at the spot where, according to analogy with York and Lincoln, the western wall *ought* to be found. Seeing HARRY JACOBS, who occupies premises next to Berkeley Street, standing at his shop door, it suddenly occurred to me to ask his permission to go into his cellar, that I might carefully examine its walls. "What do you expect to find in my cellar?" "I am looking for the old city wall; it ought to be somewhere about here." "You wont find it in my cellar; but I'll tell you what you *will* find, and that's a great piece of masonry that has given me no end of trouble. But come and see for yourself." A lamp was brought, and in a few minutes I had the delight of finding my theory supported by proofs *nine feet thick*, in the shape of the massive buttresses forming part of the Castle of the West Gate of the Roman city of GLEVUM,—need I say the identical piece of masonry of which its most fortunate owner complained that it had given him "no end of trouble!" The unconquerable hardness of the Roman mortar had compelled him to leave it, blocking up part of his cellar; or else it would long ago have been cleared away, to make room for pottery of much more recent date than either Samian or Upchurch ware. With this fresh clue I got into daylight again, and soon traced the line of wall *forward* under the houses on the right of Lower College Court, its direction being straight into the porch of the Cathedral; and

IV



"GLEVUM" OR ROMAN GLOUCESTER.

backward, along the space between Berkeley Street and the Shire Hall. This building stands partly in the "made ground" of the ditch of the city; and as a consequence it shows a *crack* all the way down its main wall, in the side next Berkeley Street. This cracking of walls, and settlement out of perpendicular, resulting from building partly on the wall and partly in the ditch, has been one of my aids in discovering the line of the old fortification at various points. My own premises have a magnificent crack running through the centre, which, to any person of taste, enhances their value by several pounds a year.

Perhaps the most striking effects of this uneven substructure are to be seen in coming into Gloucester from the Station *via* King Street. The warehouse at the end of this street next the Cattle Market is nearly a foot out of perpendicular, and is only kept from falling by several brick buttresses at the back, in the ditch. Some of the houses on the right side of Aldate Street, looking towards the North Gate, are in similar plight.

Let me now briefly mention the points along which the wall runs, in order that anyone who wishes, may trace it for himself. The Ordnance Survey will at some future period publish a map of Gloucester, which will show its track; but it may not be for some years to come. [See the accompanying plan, in which the red line indicates the wall and the position of the gates.]

Beginning opposite Eastgate House, it first passes under the shop now occupied by Neininger, the watchmaker, who lately removed a portion of it to build the cellar of the first house on the left of Queen Street. The large facing-stones of part of the wall were taken out by the masons, and several of them set on the *opposite side of the cellar*. I mention this to put any archæologist on his guard against mistaking their present position for their original one; which might easily be done by a stranger. One of these large stones is recessed for an inscription, either legionary or centurial; but I fear the letters are injured beyond the possibility of deciphering. *Above* the courses of these large stones the core or centre of the wall was of *herring-bone work*, exactly like that now so unfortunately visible in the south wall of Caerwent, where the facing-stones are stripped off. In the part on my own premises there is *no* herring-bone. Of this, however, presently. The mason who removed these stones told me that the Roman mortar had sharp river sand in it, which must have been brought from a distance. They certainly paid extreme attention to their sand, as we see from VITRUVIUS.

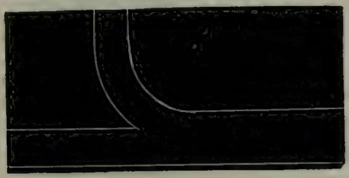
The *lewis-hole* of a large block in the lower courses was *turned downwards.* I do not lay much stress on this; as it may have occurred from the stone accidentally tipping over in the act of landing it. If not accidental, it is a proof that the herring-bone masonry is *later* than that in my own premises.

Leaving NEININGER's, the wall runs under the back of the Co-operative Stores, where I am told, they removed a solid mass of hewn stones like the base of a flanking tower, 8 or 10 ft. square. It was here that the "third brass" coin of Constantine was found. These flanking towers, as at Caerwent, were additions made to the wall in the Constantine period. They were probably thus solid to form a platform for the *balistæ* used in hurling stones at an attacking force. These *balistæ* were made to throw weights varying from 4 to 250 lbs.

The raised path known as Constitution Walk is on the top of the wall, which next passes into the grounds of Brunswick House, keeping parallel with Brunswick Road as far as to the end of Parliament Street, or "Green Dragon Lane." Just before reaching this point there is an excellent specimen of it in a stable behind BOND's greenhouse. Brunswick Road itself runs along the line of the fosse. What the exact width of this fosse was I have not yet succeeded in establishing. That of Uriconium measures about 95 English, and is therefore nearly 100 Roman, feet. Keeping in mind that the Romans were very much given to even measures of *tens* and *hundreds*, I have no doubt that 100 ft. was a sort of standard width for a city ditch; and that the one at Gloucester will be found to have measured as much, at any rate on this East side.

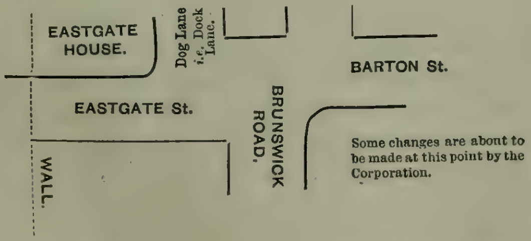
The corners (or "*coxæ*") of the walls were rounded off. This is the cause of the curve at the junction of King Street with

Aldate Street, as well as of the peculiar, and till lately exceedingly awkward, entrance of Parliament Street from Brunswick Road.



This rounding was disapproved by Vitruvius, as giving more shelter to a besieging force than the older square corners did. Apropos of Vitruvius, I must mention that he advises the roads leading from the gates of a city to be inclined to the *left*, in order that an approaching body of men should be exposed to the archers and slingers, and the dart engines, with the *edges of their shields opening*. If the reader will for a moment imagine himself a soldier of the Roman period, with his shield on his left arm, he will see that in turning towards the left he exposes himself, while in turning to the right he covers his body *more*, from a projectile aimed at him in front.

Now the roadway, both at the East and the West Gates of Gloucester, still retains this *bend to the left*. At the East Gate it has caused a positive kink in the street.



At the West Gate it is more softened off, but still unmistakeable. The wall runs along the back of the gardens on the right of Parliament Street; and a fine piece of its upper or mediæval structure may be seen just above Matthews' the upholsterer's, in Southgate Street. The Castle of the South Gate projected forward 54 feet from the line of the wall; and the same appears to have been the case at the other Gates. Some years ago the City Surveyor came upon the foundations of the piers of the South Gate, at a depth of eight feet below the present street.

The area of the Gate-Castles corresponds with that of the Mile-Castles on Hadrian's wall; for they average about 60 × 50 = 3000 feet. This space was therefore evidently a standard one to enable a given number of men to mount guard.

The bending to the left, which has just been mentioned, is noticeable here also. On the north side of the city the position of the roadway from Cirencester would not admit of this. It turns rather sharptly to the right. But as this was the Roman road to London, the risk of attack would be less at the North Gate than at either of the others. Along the sides of the London Road the Romans buried their dead; and on some ground at Wotton belonging to J. D. T. Niblett, there were found, not long ago, one hundred and ten cinerary urns; one of which is in the Arkell Collection in our Museum. It was at Wotton, too, near the junction of the London and Cheltenham Roads, that the gravestone of the horse-soldier, Rufus Sita, was found, about the beginning of this century.

But to return to the wall. Crossing at the South Gate, on the right of the site of the City Prison (itself a relic of the fortified period) we strike into Commercial Road, just where it makes a bend. The wall runs from this point (on the right hand side) straight down to the corner of the County Prison. This edifice stands on the site of Gloucester Castle, *outside* the wall.

A large number of the Roman hewn stones must have been removed from the wall to build the Castle; for they were taken from the demolished Castle to construct the western outer wall of the Prison, next the Severn. They are cased with brick on the outside; but in the Prison yard they are fully in view.

Passing the Prison, along the Barbican, we come to some cottages on the left, standing in the ditch; the descent from the wall itself being five or six feet down steps. Where the Barbican opens into Bearland there is a beer-shop standing partly on, and partly off, the wall. When I took Corporal Godwin, of the Ordnance Survey, into the cellar of this house, to plot the point on his map, he became an object of strong suspicion to the daughter of the landlord, who seemed to think he was taking stock of the beer-barrels for legal purposes. In spite of his attractive uniform she showed undisguised satisfaction at his departure. This examination of the track of the Roman wall of Gloucester required a sort of subterranean journey in many parts of the city: descents into little places filled with firewood and empty boxes; clambers over coal-heaps, with one's back bent double, a lamp in one hand and the end of a measuring-tape in the other; while in one of these interesting spots the snarling of an invisible dog suggested that the sooner we got back into daylight the better it might be for our ankles. In many of the cellars only the part close to the floor betrayed the presence of the wall; all above being of modern brick-work.

Passing along parallel with Berkeley Street, it reaches the West Gate Castle, under JACOBS's shop, already mentioned. Coming to the other side of Westgate Street, we find it running under the houses on the right hand of Lower College Court, straight for the Cathedral porch. The side of the last house at the corner of College Green is built upon three courses of the large wall stones, matching those on my own premises.

At the Cathedral the Roman wall has been entirely removed, to get a good foundation; the material being used in erecting the Abbey itself. Some of the great Norman pillars in the nave seem to give evidence of this, in having courses of larger stones in the upper part of the shafts than some that occur lower down, and the dimensions of which correspond with those I find in the wall. I account for this on the supposition that the demolition of the wall was carried forward *at the same time* the pillars were being built. As portions of the *lower* courses would reach the masons when their work was advanced, the larger stones thus furnished would come in for the upper part of it, amongst the others. That Roman materials were used, is shown from the presence of Roman tiles here and there, in the midst of the stone-work. I remember J. D. T. NIBLETT pointing out to me, some years ago, in the last pillar going up the nave, on the right, one of these tiles placed on its edge to complete the band of stonework near the top. It fills a slot of about two inches wide. There are several outside, in the older parts.

The moat of the city was fed by the River Twyver. This stream, which has been covered in during the recollection of most of us, still runs along the north side, close to the wall. Now on reaching the north-western angle, we come to a rather sudden fall; for the western front of the city was lower than the other three sides. This will account for a Mill having stood here in the time of the Abbey of Gloucester—and very possibly before and after that time. At all events, Palace Yard was called *Millard's* Green* till within twenty years ago; and the late JOHN BURRUP once told me he had an old drawing of the Mill, which formed part of his own house; that is, in the left hand corner going in from College Green.

In looking back *through* the mediæval Gloucester to the Roman City, the foreshortening of the long line of centuries traversed by the mental vision, produces some curious effects. We see, not only the destruction of a piece of the original wall, to make way for the Abbey, but some further changes following on this. One of these changes was the erection of the limitary wall of the College Precincts *further westward* than the Roman city. There is evidence that a stream of water once flowed on the outside of this wall. In building the chimney of the Crown Brewery, they had to go down some 14 feet through *made ground* to get a foundation; and on the other side of the Westgate Street, just within the lower entrance of Bearland, the mast and part of the tackle of a *boat* were found, in sinking a well. The water of the Severn still covers nearly the whole of this area in very high flood.

Besides this, there is the philological evidence, in the names "*Water* Street," "*Dock*ham" (*i.e.*, Dyke-ham, both Dock and Dyke being from verbs signifying *to cut*,) and "St. Mary de *Lode*," (*i.e.*, "Saint Mary of the *stream*,") the parish *outside* the wall in question. This lode or stream feeding the broad moat, must have been the Twyver, from its course past the Mill already mentioned.*

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* Millard = Mill-ward, keeper of the Mill.

Just below the part of Westgate Street where the "Little Severn" must once have come, is what is called "Saint NICHOLAS Church." I have doubts whether NICHOLAS was really a Saint at all; but he was regarded as the patron of sailors; and it may possibly have been considered fitting to dedicate to him a place of worship on the river's bank. The ground it stands upon is several feet below the level of the present street.

In confirmation of DOCKham being the local term for DYKEham I may adduce the name DOG LANE, next my own premises, at the opposite end of the city, covering the actual line of the fosse. It has not an attractive look—no one would care to head fancy note-paper with it—and I confess to having had an idea of suggesting that the Corporation should call it Dog-*Rose* Lane instead; and then gradually drop the first syllable, as needless. But *Dock* Lane is clearly its proper form. At the time the Saxon word *Dock* was applied to the fosse of the city, it is evident it had not become, as it now is, restricted to a "*cutting*" intended specially for ships.

I recollect, many years ago, often hearing a tradition in vogue among the inhabitants of "THE ISLAND," that "in old times" boats had been used on Dockham Ditch, laden with stone for the building of "the College."† H. Y. J. TAYLOR tells me that there is a similar tradition still lingering about the neighbourhood of Upton and Cooper's Hill, as to the Twyver having been used for floating rafts laden with stone for building "the College." They say the stream was dammed at certain intervals till the water accumulated sufficiently to carry the raft over one such reach at a time; the

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* Since writing this I find an arm of the Twyver still runs there, underground.

† The *only* name by which the Cathedral is known to many of the poorer inhabitants of the city. The fact is, the Abbey only became a Cathedral in the time of Henry VIII, and there has not been time to accustom the people to its new name. It is only the third of a thousand years since the change was made: a mere nothing in a city that has stood for nearly a third of the world's history from Adam!

dams being broken in turn to let the rafts through, and then reconstructed. We here see a process which may have suggested the first *canal lock.* Rough as this method was, a similar one is still largely practised in the mountain districts of France in floating timber, where it is known as "*Flottage à buches perdues ;*" the difference being that in this flottage the trunks of the trees are thrown in loose, and swept down at random by the rush of water. The same plan is used in America.

It is exceedingly difficult to condense into a paper like this all the details that are deserving of notice ; and since the foregoing has been in type I have been enabled, by the kind aid of H. Y. J. Taylor, to obtain some further information bearing on the subject. He tells me that the dam of the Abbey Mill was found a few years ago, in building the Bishop's Palace ; a number of stakes or piles being driven into the bed of the stream to form it. He further tells me of a tradition of old Severn watermen, that in "old times" a branch of the River ran *inside* part of the ground now covered by the Docks and the County Prison. This is confirmed by ancient maps ; as well as by the quantity of "made ground," mud, &c., that had to be removed to get a foundation for the chimney of the Mill, on the north side of the smaller dry dock.

These traditions taken by themselves would be of no weight ; but as part of a body of cumulative evidence we cannot ignore them. That the "Ditch" was very wide near its junction with the Severn we see from its having required a two-arched bridge as late as the beginning of this century. The part below this bridge was, and is still, called "The Island." The spot where it stood was known till within the last ten or twelve years as "Foreign bridge," or "Farden bridge."

I have just "interviewed" Richard Price, an octogenarian, for 60 years commander of a barge on the Severn, now resident in the "Bartlemas," who remembers this "Farden Bridge," as he calls it, as a stone one, of two arches. In Speed's map (1610) it is shown as a bridge of *three* arches. In Leland's *Itinerary*, two generations earlier still, it is described as "Foreign Bridge," and of *seven* arches. The stream must have gradually silted up.

Captain Richard Price tells me he is eighty-two years of age, and that when he was a boy of fourteen he was winding at a well they were making just in the bottom of Bearland, when they came down upon the mast of the boat I have mentioned. It lay north and south, or nearly so. The part they got at was near the heel of the mast, which was of pine, 13 inches in diameter; big enough, as he remarked, for a barge of 80 tons. The shrouds were with it—"big ropes, *wormed;*[*] but they all went to dirt as soon as they was handled."

From the fall of the ground between the Roman West Gate and this part, I have no doubt that the Romans cut this channel to serve as a moat at some distance *in advance of the wall,* to obtain a suitable level for it; and that the mediæval extension of the city consisted in taking in the piece of ground thus left—*i.e.*, between the wall and the water's edge.[†]

I believe we have a trace of this piece of open ground having stood in front of the wall, in the name of the part at the back of the Shire Hall, and which I have spelt in this paper according to the present usage, *Bear* land. I find however in a rent-roll of the city, dating back to 1535, it is given as "*The bare land.*" It seems probable that this was its true designation; for as late as 1644 the ground below it, where the Militia Barracks now stand, *had never been built upon.* The Booth Hall, too, the ancient court-house, seems to have been erected on a site *the property of the city,* being a portion of the "bare land" itself.

Such a space of bare land (the Pomoerium) was always reserved next the walls of a Roman colony, and considered sacred.

With the data we now have we can picture to ourselves with something approaching precision, the appearance presented by the Western Gateway of the city seventeen hundred years ago.

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[*] *Wormed* means with a small cord laid along between the grooves left by the strands of a large cable, &c., to fill it up and round it off.

[†] There is in the *present channel* of the River, at eight feet below low water, a massive wall running from near the north end of the Prison to the Gas Works, part of it passing under the gateway of the latter. It is certainly Roman. A beautifully perfect fibula was found on removing part of it. In digging for the chimney-foundation at the Gas Works they found the bones of a sturgeon.

We see where the Walls ran; of what stone they were built; the size of the Gate-Castles and their shape. We know from other Roman Walls of the period, such as those of Pompeii, the size of the battlements,* and a variety of other details in which such analogy may be safely trusted. The appearance was this:—

A splendid line of Oolite-stone wall, crowned with battlements, and with a central gateway, projecting 54 feet from the rest and rising above it. In front of this wall sloped an open space, coming down to a broad moat, deep enough to float vessels of 70 or 80 tons. This moat was crossed by a wooden bridge, easily removable in case of attack.

By the kindness of my friend JOHN KEMP, of the School of Art, I am able to place before the Cotteswold Club a sketch illustrating this, and which may be relied on as faithfully representing the *Porta Prætoria* of the city, as it would have appeared to a visitor from the country of the Silures, come to pay his respects to the authorities, or to see if one of the heads above the gate belonged to a member of his own family.

The north-west angle of Roman Gloucester stood about the centre of the present cloisters; and thence the wall ran straight to the North Gate, opposite Aldate Street; that is, a little above Hare Lane, which must have skirted the outside of the ditch. From this point it went along the left side of Aldate Street. Two years ago I saw a very fine piece of it breached to make way for part of a warehouse. One of the stones removed by the masons measured seven feet in the bed by about one foot nine inches thick. Next to this, at the back of BILLINGHAM's paper-hanging warehouse, there is a part of the wall entire. It is a very striking sight,—with its great hewn stones, some of them three to four feet in length, black and furrowed with deep grooves from the lapse of ages.

I am informed by H. Y. J. TAYLOR that in sinking for the

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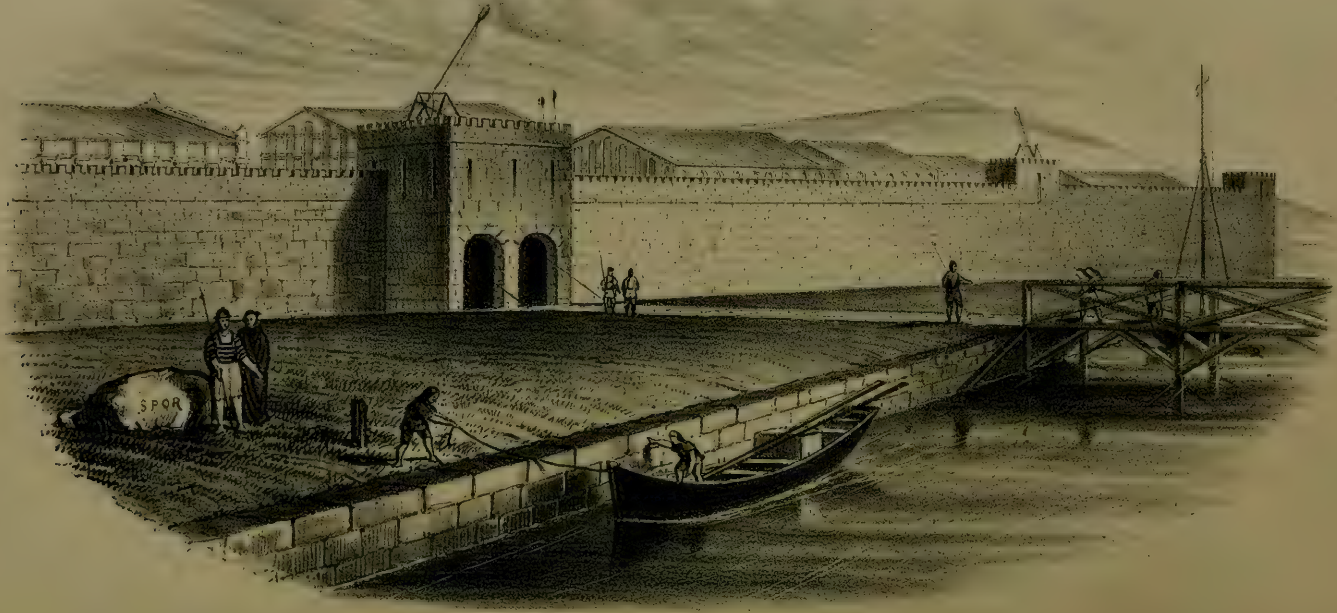
* The battlements at Pompeii are 2½ feet wide; which with the intervening opening gives 5 feet. In the Roman line of battle 5 feet was the space allotted to each man to have free play for his weapons. This would give, for the Mile Castles on HADRIAN's Wall, as well for the Gate Castles at Gloucester, a frontage for 30 men to act, besides those working catapults.



GENERAL APPEARANCE OF THE WESTERN WALL OF ROMAN GLOUCESTER (GLEVUM) DURING THE EARLY PART OF THE SECOND CENTURY.

Sketched by John Kemp from the data furnished by John Bellows.

BRITISH MUSEUM

foundation of a chimney stack, between this point and the North Gate, but on the *outside* of the ditch, they found rushes and other aquatic plants, as well as a strong landing-stage built of beams of oak. It was however covered in again.

Beyond this we come to a row of houses resting partly on the wall and partly on supporting brickwork from the fosse at the back, which is a deserted burial ground.

We have here reached the north-east angle of the ancient city; and the wall runs hence in a straight line to my own premises—our starting-point.

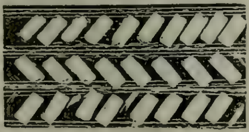
Now a few words on the character of the masonry itself, and its probable age.

Most Roman Walls in the south of Britain have pounded brick in the mortar, and bonding courses of tiles to relieve the stonework. So frequently is this the case, that more than once I have seen visitors shake their heads at the masonry forming the subject of this paper, with the remark that it could not be Roman because these materials were absent.

The best answer I can offer to the objection is, that in the grandest monument ever built by the Romans in Britain, the Wall of HADRIAN, there is neither brick nor tile. It is constructed of two faces of stonework, flat pointed, with the intermediate space filled with rubble laid dry and grouted. The facing-stones are cut wedge-shaped, to give a better bond with the centre-mass. The mortar is composed of lime, gravel, and sharp sand. This was the method of building considered the best in the time of VITRUVIUS.

In every one of these details this portion of wall I have laid open at Gloucester corresponds with those of the Wall of HADRIAN.

But in some parts of HADRIAN's Wall the centre, or core portion, has been built with stones placed herring-bone-wise,



and with the mortar hand-laid on top of each course. This is not such firm or good work as the rubble grouted; because the mortar only penetrates part of the way into the interstices, instead of forming a solid mass by completely filling them. The reader will see that I mention such herring-bone work occurring at NEININGER's on the opposite side of the East Gate from my own premises; and that it also exactly matches the building in the walls of Caerwent.

Caerwent was a supporting station to Caerleon, which from the testimony of TACITUS, confirmed by PTOLEMY, we know to have been the head-quarters of the second Augustan legion *during the first century.* Caerwent, from its position, must have been occupied by the legion *before* Caerleon; for it lies nine miles east of it, and is the key to its approach either from the Cotteswold Camps across the Severn, or from Gloucester by way of the Forest of Dean. We are then certain that as the second legion was the one which held it, *from the very outset, its walls were built by that legion.* That they were built at an *early* period is shewn by the flanking towers *not being bonded into the wall.* They were *added* afterwards. Now in several of the stations on HADRIAN's Wall there are memorials of the second legion, showing that its men shared largely in the construction.

The reader can put these facts together for himself, and I think he will see what I am driving at. HADRIAN's Wall, partly built by the second legion, presents the exact types of masonry, and the same materials in the mortar, which I find in the north and south sides of the Decuman Gate of Gloucester; and these *types and materials together, without brick, are not generally found elsewhere in the south of Britain.*

There is another point in the Gloucester wall which is not infrequent in those of Roman build, but which I must not pass over. All along one of the courses, at irregular intervals of from three to five feet, there are square holes running transversely through the wall. They are four or five inches in diameter; and I found them filled with fine black mould. My archæological visitors have given many explanations to account for them; but not such as are satisfactory. The general idea seemed to be that they were for drainage; but as they occur at some two feet *above* the ancient level of the street, there could have been nothing to drain at such a height.

I have accidentally stumbled upon the clue to these holes in VITRUVIUS. In his directions for building the walls of a city he says that the two faces should be bonded together by *bars of olive wood,* as that timber is indestructible. Now olive did not grow in Britain; but oak did, and it appears likely that the builders, accustomed to saw the olive into quarter-stuff for this purpose, *sawed oak down to the same size and used it instead.* The decay of the latter would account for the vegetable mould I find in the holes.

The monks in the middle ages took a hint from this Roman plan of bonding stonework with timber; but they used their bonds *longitudinally* instead of transversely. How long the practice lasted during the Roman period I cannot tell; but VITRUVIUS lived about the time of AUGUSTUS; and the nearer we get back to that time the more likely we are to find the kind of building which was then thought the *best.*

I have shewn the points of agreement between the Gloucester wall and HADRIAN's. I may next mention some in which it coincides with those of the Roman Stations between this city and CHESTER inclusive.

The lower part of Gloucester wall at the East Gate stands, from nine or ten feet in depth in *water.* All this portion is built, unlike the upper part, of massive blocks of hewn stone *laid without mortar or cement of any kind,* for the water to play between them. The weight on both sides the structure thus always remained the same. The free flow of the water at every cranny prevented any washing out of the foundation, and ensured that absolute permanence which has left the whole mass as sound as if finished but yesterday.

Now at Chester, (the station of the twentieth legion) the great meadow next the Dee, outside the city, is liable, like our own "Ham," to floods. Wherever the water thus washes the walls the same method of building has been followed, no cement being used, but free ingress and egress allowed for.

Besides this, none of the walls of Stations from Cirencester to Chester inclusive (Gloucester, Kenchester, and Wroxeter between) have any brick or tile in their construction.

On the other hand, if we take LONDON Wall, we find it had both; and a very able and careful writer, who reported an examination of it in the appendix to a volume of LELAND'S Itinerary, considers this wall to be of the CONSTANTINE period. I have no doubt he is right; and that the presence of brick and of tile courses in BRITAIN (*not* necessarily on the Continent) will be found pretty sure indications of *later* Roman work than where these marks are absent.* The Romans found neither brick nor tile here when they invaded the country; and we can hardly suppose they would waste their time in making *new* bricks merely to pound them up. On the other hand, after an occupation of a century or two had given them *old* materials, nothing is more natural than that they should use them to improve their mortar or concrete, especially where sand and gravel were scarce.*

For these reasons among many, I believe the wall of Gloucester to go back to a period at least as old as HADRIAN'S. The very presence of ware of the *second century*, (as it is decided to be by an expert of the British Museum,) lying in contact with the wall, confirms this; for the wall must have been built *before* rubbish could be thrown against it.

Let us now turn for a moment to the state of Britain, and HADRIAN'S object in building the wall from the Tyne to the Solway, and placing upon it such a formidable standing army.

At the conquest, under CLAUDIUS, we find that the people of the Cotteswold Hills (the *Boduni*) were among the earliest to acknowledge the Roman authority; while the *Silures*, or South Welsh borderers, remained exceedingly troublesome. The camps along the Cotteswold Hills, (which are among those mapped in the present number of the Transactions, by GEORGE F. PLAYNE,) with Gloucester, were intended to keep them *beyond* the *Severn*, which was unquestionably fixed upon by the Romans as the western boundary of this their first Province (or *Britannia Prima*). During the latter half of the first century, as TACITUS tells us, a legion was planted in the heart of the country of the Silures, to bridle them more effectually. We know from the hundreds of remains dug up there, that the spot so designated was CAERLEON, and that the legion was the *second,* called the Augustan. *Where had this second legion been stationed before its removal?* Certainly at Gloucester, the key of the Severn, and (then) boundary of the Empire westward. Its move was in reality a pushing that boundary to the *Usk* instead of the *Severn.* This will account for the identity in character of the masonry at Gloucester and Caerwent, and in the Wall of HADRIAN where the second legion was employed. I omit comparison with the wall of Caerleon itself, because I am not sure that the small portion of it which I have as yet been able to examine may not be of a later date. In its shape, Caerleon is a *precise repeat* of Gloucester, with a *Castle* outside, in the same relative position on the Usk as that at Gloucester had on the Severn. The area of Gloucester was about 2,022,000 square feet, and that of Caerleon, as per COXE's map, about 1,956,000 feet. A Camp on Salisbury Plain, called by the Ordnance Surveyors "VESPASIAN's Camp," has an area of about 2,060,000 feet, and another, some miles from it, which, from its name, *Casterley,* must have been Roman, measures 1,951,000 feet. I give these measures subject to correction, as I take them from maps.

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* Silchester (the Roman CALLEVA) has walls of herring-bone, bonded with courses of tile. The city is *not* rectangular.

HADRIAN on ascending the throne found the Empire weakened by its very extension; for almost all the Emperors, including TRAJAN, had been constantly adding to it; and he very wisely reversed the policy of his predecessor by devoting himself to consolidating and strengthening it; in some instances by withdrawing the boundary to points well defined and easily defensible. He relied more upon the trowel than the sword; and he attached a special corps of masons to every legion.

On his arrival in Britain (about A.D. 120) he withdrew the north boundary from the hazardous mountains conquered by AGRICOLA in Caledonia, and built the stupendous wall from one sea to the other,—74 miles in length and 25 feet in height, of which, if the reader is not already familiar with it, he may learn the history, in a very interesting little work by Dr. Bruce: "The Wallet-book of the Roman Wall."

At every four miles along this fortification there was a station for 600 infantry or 500 to 1000 cavalry; besides a castle, the size of those at the gates of Gloucester, at every mile, and sentry stations at every quarter of a mile. The Roman period is so distant that we hardly realize it. Here were from *ten to fifteen thousand men*, kept on guard day and night for *three hundred years, on this wall only;* besides a legion at York, another at Chester, another at Caerleon, and cohorts of foot, or wings of cavalry, at nearly all the large towns in Britain.

If England had kept up an army of fifty thousand men, say in the far north of India, from the days of Queen Elizabeth to the time of Victoria, we should have even in this a picture far short of the reality of what the Romans did in Britain when the population of Europe was but feeble in proportion to its present number.

I have shewn a certain agreement in the masonry of the stations severing Wales from England. The reason for this, it appears to me, was a similar one to that which decided Hadrian to plant his wall and garrison across from the Tyne to the Solway: *i.e.*, to prevent a coalition of the British tribes on the two sides of the boundary; or an invasion from one side of it, to the part well settled under Roman rule.

But in Wales they had two chief points to guard: the Severn and the Dee; as the greatest massing of the natives had taken place near the mouths of these rivers.

Of these two divisions, that of the Silures, or South Welsh, was by far the more formidable; as their repeated onslaughts on the Roman boundary had within a few years of its arrival compelled the second legion to move its base into their very midst.

While the second legion was stationed to hold the Severn, the twentieth placed its camp on the Dee; where, under Agricola, it succeeded in so far destroying the tribe there (the *Ordovices*) that we find it able to spare large detachments of men for service farther north.

NATURAL HISTORY.

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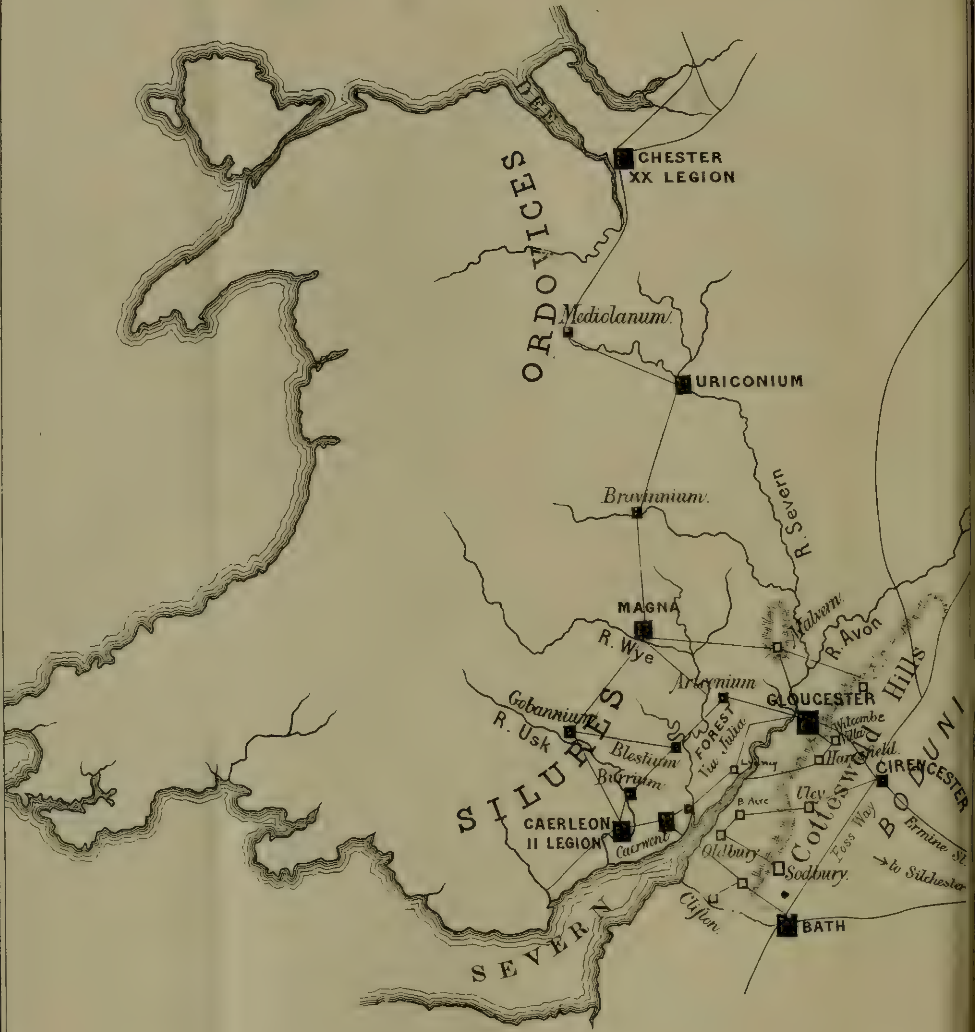


SKETCH MAP
SHEWING THE CONCENTRATION OF THE
ROMAN FORCES
ON THE
LOWER SEVERN,
TO KEEP THE SILURES FROM INVADING THE PROVINCE OF
BRITANNIA PRIMA.

The larger squares are stations capable of holding a full legion; the smaller ones, forces of from 1000 to 3000 men if needed. The outline squares are camps on the Cotteswolds, & those of Bloody Acre and Oldbury on Severn &c.

The chief attacks on the Province Britannia Prima (district south of a line from Gloucester to the mouth of the Thames) would therefore be from the *South Welsh only;* and would accordingly be made in the direction of the *first points at which they could readily get across the Severn.* This the Romans guarded against by the camps along the Cotteswold Hills, and still more by the triple rampart afforded by the strong walled cities of Caerleon, Caerwent, and Gloucester, against which the waves of a Silurian invasion would be compelled to break in succession before they could overflow Britannia Prima. Any attempt of the Silures to get round into the Province by way of central Wales, would be checked by the forces at Magna (near Hereford) and by troops of the twentieth legion sent from Chester and its subordinate stations to support them.

The extraordinary strength of the barrier thus opposed to the Silures, by massing the Roman forces on the Severn, is shewn in the accompanying map (No. V,) in which the larger squares represent cities capable of affording shelter to an entire Legion; and the smaller ones stations sufficient to receive from a fourth to a half as many men. The outline squares represent some of the larger camps on the Cotteswold Hills, and those of Bloody Acre, and of Oldbury on Severn.

A great number of smaller intermediate camps are omitted.

When HADRIAN arrived in Britain (A.D. 120) he either found this plan of defence on the Severn, or possibly, perfected it. Whether he built any part of the wall of Gloucester I cannot tell; but putting together the facts I have mentioned, as to the correspondence both in the style and material of the masonry, and in the measurements of the castles, and other details of our wall, and that which HADRIAN is *known* to have built from the Tyne to the Solway, I think there can be no room for doubt that the *same men he employed—i.e.* the ENGINEERS OF THE SECOND AUGUSTAN LEGION—were also the builders of the work I have been examining.

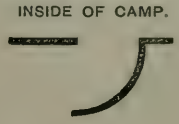
Besides the identity of masonry, we have the broad fact that the second legion was the one which conquered most of the southern portion of Britain, and certainly the Cotteswolds; as well as its finally quartering in a city largely *dependent on Gloucester for support in case of any formidable attack.*

As further evidence of the early *period* of the wall, we have the close approximation to the *Polybian* plan of castrametation, which is quite lost in the later Roman cities of Britain; and the fact that the method of building was the one most in vogue in the time of Vitruvius, which in the decline of the Empire ceased to be followed.

It is surprising to note, during the palmier days of Rome, with what persistence they kept to certain standard measurements. Earlier in this paper I have mentioned that the ditch of Uriconium was 100 (Roman) feet in width; and the one at Gloucester, as nearly as I can judge without actually proving it, was about the same. I have just lighted on a statement that the fosse of Rome itself, as made by Servius Tullius, was 100 feet wide by 30 in depth. The city of Rome, in its earliest form, "*Roma Quadrata*," which stood on the Palatine Hill, seems to have served as the model for garrison cities in the most distant parts of the Empire, down till the second century. It was a square, about the size of the Roman city of Gloucester.

The radius of the curve of the wall at the corner of Green Dragon Lane is 60 feet. This at once gives us the width of the roadway round the camp inside—60 feet. I find the roadway round Uley Bury camp to be also 60 feet wide. These coincidences are not accidental, but the result of a definite space being allowed for the movement of a given number of men.

Uley Bury must have been used before any walled city was built here; no doubt at the first coming of the Romans on to the Cotteswold Hills. The second legion was the principal one concerned in this invasion; but the form of a "curtain" covering an entrance in the northern side of Uley Bury, is one which I only find matched by those of the camp-gates of the *ninth* legion, in Scotland, as figured by General Roy. I suspect



the ninth legion, or some part of it, must have taken part in the first Cotteswold campaign, though it was afterwards stationed at Camalodunum, where it was nearly destroyed by BOADICEA. In TACITUS' History (iii, 22) we find vexillations (bodies of 1000 men) from each of the *"three British legions, the ninth, second, and twentieth,"* taking part in the war between VITELLIUS and VESPASIAN, in Italy. This was in the year 69.

Last summer I measured the width of a piece of the *Via Julia* I found in the Forest of Dean. It averages eight Roman feet. The paved road up to the temple on the Alban Mount at Rome —the central point of veneration to all the Latin tribes—was of the same width. This military road connected Gloucester with the Colony at Caerleon, and was certainly made when the Second Legion was moved onward to those dangerous quarters in the heart of the country of the Silures: that is to say, under JULIUS FRONTINUS, in the reign of VESPASIAN.* These are positive data, which enable us to realize that this now ruined Causeway was being paved before the closing chapters of the New Testament were written, or JOHN was banished to Patmos.* Even *then*, as we know from TACITUS, these Cotteswold Hills had already been under the Roman sway for a whole generation. History and Archæology, like Charity, should begin at home; and I cannot but feel that our local Roman Remains—this WALL, and this JULIAN CAUSEWAY, ought to have *for us* far more interest than TRAJAN's Column with its panorama of the Dacian Victories, or the Arch that records the siege of Jerusalem by that same TITUS who before the Judean War, in his boyhood, had accompanied his father in the Second Augustan Legion over this very country of the BODUNI.

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* TACITUS (*Life of* AGRICOLA, xvii.) says of FRONTINUS: "He was a man truly great, and sure to signalize himself whenever a fair opportunity called forth his abilities. He reduced to subjection the powerful and warlike state of the SILURES, and though in that expedition he had to cope with a fierce and obstinate enemy, but with *the difficulties of a country almost impracticable,* it was his glory that he surmounted every obstacle."

JULIUS FRONTINUS was an able lawyer, as well as a man of remarkable uprightness. He desired at his death that no monument should be raised to his memory, which he said would be sufficiently known by his works if they should be found to deserve praise. He wrote a treatise on the aqueducts of Rome, which is still extant. Of his skill as an engineer the reader may form a better idea than from any book, if he will go over the line selected for the road I have spoken of, in the Forest of Dean. TACITUS might have included this in his description of the country as "almost impracticable;" yet with wonderful skill the road is carried over the easiest gradients in the Forest; especially the part running along the most beautiful glade between Soudley and Blackpool Bridge. I am sorry to learn from a landed proprietor in the Forest that many tons of the paving-stones of the Roman Causeway have been removed to build the fences of recent enclosures. Is it too much to hope that the Government Commissioners will take steps to preserve the one perfect piece of the paving at Blackpool Bridge? There is scarcely a spot in the whole of Great Britain of greater interest, although it is so little known!

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* It is quite certain that the second legion would not build a city in the heart of the most dangerous district, without *first* making a road to it from the nearest great military station. Their landing-place at Portskewett, (three miles from Caerwent and 12 from Caerleon) is also well worth a visit. This great camp on the cliff (marked on the Ordnance Map) secured their communication with the camps at Oldbury, and on the Cotteswolds; as well as with the main stations of Bath and Silchester. That the latter place (then called CALLEVA) was a grand military centre, is shown from the miles being reckoned from it in the Antonine Itinerary.

Since this paper was in type I have examined the cellar of JOHN BURRUP's house already mentioned. In the floor of it there is a *millstone* perfect, three feet in diameter; evidently from the old mill that stood there.

Notes on Sherston Magna, by JOHN JONES, F.A.S.L.

Some years ago, when I was about to leave the county, I remember recommending to the Cotteswold Club a visit to the village of Sherston Magna, in Wiltshire, but lying immediately upon the border line of Gloucestershire. Whether this excursion was made by the Club I do not know, but there is so much of historical interest about the place, and especially in that point to which I believe I am the first to call attention, that I feel justified in once more bringing it under your notice. I have not myself visited the place since I was a boy, but I recollect well the lines of earthworks and trenches traceable almost everywhere around it, which bore out, to some extent, the universal tradition of the inhabitants, and of the people of the surrounding district, that it had once been a place of great importance and strength, and that it was formerly called the *City of White Walls.* This appellation, as will appear in the sequel, is the point of importance which I wish to submit to your consideration.

Before I discuss this, I propose to give a brief summary of the general history of the place, taking the events and circumstances connected with it in backward order, premising that, being in the Hundred of Chippenham, to which the work does not extend, no mention of it is made in the county history of Sir R. C. HOARE. The dialect of the people *was*, (and I doubt not *is*,) very peculiar; amongst other things, I was much struck with certain words, and modes of speech, which I had never heard before, but which so impressed themselves upon my memory, that when, many years afterwards, I commenced an acquaintance with the Anglo-Saxon tongue, they came back to me as freshly and distinctly, as though recently heard. The purity of the Anglo-Saxon of the district is remarkable, especially in regard to all terms connected with agriculture, and its implements. EDMUND IRONSIDES defeated CANUTE THE GREAT here, in 1016, and the place still rings with the fame of a local hero, named JOHN RATTLEBONE, who is said to have killed with his own hand, a whole "skillin-vull" of Danes—"skillin" meaning, I was told, the bay of a barn. He gives his name to the principal Inn of the place, and if the signboard over the door, as I knew it, bore only an approximate resemblance to him, he must have been as remarkable in appearance, as for prowess.

I remember that upon asking my informant what a Dane was, he replied that he did not know, but that he "had heard there was one then at Salisbury," *i.e.*, the Very Reverend the Dean. This circumstance first gave me the idea, which has since been frequently confirmed by analagous instances in other countries, that the correctness of mere names and words, preserved in traditions handed down orally to persons ignorant and uneducated, who have not the faintest conception of their true meaning, is one of the best guarantees of their genuineness, and, consequently, of that of the tradition or legend in which they are embodied. Some writers have assumed, that JOHN RATTLEBONE was the popular impersonation of EDMUND IRONSIDES himself, but the persistency with which he is claimed as a "Shuston man," and the absence of any intelligible motive for converting "EDMUND" into "JOHN," justifies me, I think, in assigning to him the designation of "local hero."

I now come to the period when the place seems really, as a Celto-British City, to have been known, as tradition asserts, as the "City of White Walls," or the "White Town."

We are informed by the *Saxon Chronicle*, that:—"In the year 577, KOUTHWIN and KEAWLIN fought the Britons, and killed three of their kings, KONMAEL, KENDELAUN, and KARENMAEL, in a place called Deorham, and took from them three cities, Gloucester, Cirencester, and Bath." The KENDELAUN here mentioned is called in the Welsh MSS. indifferently KYNDYLLAN, KONDOLAN, and KANDILEN, and by the Saxons CONDIDAN and

CANDIDAN. He was king, or supreme ruler of Powys, and seems to have been one of the most active British chieftains who opposed the spread of Saxon dominion; and it was with him, that the Prince-Poet or Bard, LLYWARCH HEN, took refuge after his expulsion by the Northmen, from his own principal city of Argoed. He lived to see his twenty-four sons perish in various battles against the invaders, at many of which he was present himself, and of which, one, judging from his own statements, was the battle of Dyrham, which appears to have been decisive and final, between the rival races in our district.

One of the longest poetical efforts of the great British Bard, LLYWARCH HEN, relates to this battle, and is entitled "Maronad KENDELANN, mab KENDROUEN," or Death Song of KENDELANN, son of KENDROUEN. As, although a Cambrian Prince, he was present with the united Britons at the battle of Longphort, (Portsmouth), to oppose the landing of a horde of Saxons, we need not be surprised to find him here at Dyrham, with his friend, relative, and protector, whose loss he mourns so pathetically, and to whose kindly reception of himself, he refers elsewhere so feelingly, when speaking of the honours paid to himself by the men of Powys, "that refuge of exiles," in their assemblies. The "Maronad" bears evidence of having been composed under the influence of the deepest emotion, such as might be expected to affect the bard, expelled from his own Principality, upon witnessing the destruction of all his best friends and hopes, in a defeat which consigned him to a life of want and misery, enduring so long, as to acquire for him the epithet which has become part of his name, from invariable use,—HEN," the Old or Ancient.

We cannot, of course, here, enter upon lengthened details of the life of LLYWARCH HEN, but the few given seem necessary, for the proper appreciation of the allusions to be found in the elegy, to the "White City," which, supposing it to be Sherston, is but a short distance from Dyrham. Whilst, also, it would be prolix to give here the poem *in extenso*, it is necessary to give, for the benefit of those to whom it is not known, an outline of the mode of treatment of its subject, and of its composition.

It is written in the triadic form of the old Welsh Bards. It is divisible into well marked sections, in which either the slain chieftains are apostrophized, or the places in which the loss of themselves, and their companions in arms, will be most felt and mourned. It is evident that, in the estimation of the bard, his friend KYNDELANN was the soul of the British cause, not only from his capacity as a leader, but from his military power and resources. It is not easy to determine with precision some of the localities mentioned, as the VICOMTE DE LA VILLEMARQUÉ, from whose "Bardes Bretons" my text is taken, remarks, but when we eliminate those which clearly refer to the bereaved possessions of the slain monarch, in his proper kingdom, we must naturally look for the others, in the vicinity of the conflict.

It must be observed, that nothing is said in the poem, of the result of the battle of Dyrham, in the capture by the Saxons of the great British strongholds, Gloucester, Cirencester, and Bath; these we only learn from the Anglo-Saxon Chronicles. The bard seems to have been so entirely overwhelmed by his grief, for the loss of his nearest and best friends and protectors, that he could think of nothing else, and as from the context, it is clear that the remnant of the British forces retreated to Basing, (Basa) in Hampshire, where the remains of the slain Prince, with those of other leaders were interred; it would probably have been many days before these crushing consequences of the defeat could have become known to him. From the fact of Basing-* church being mentioned, as the burial place of the chiefs slain, it would appear that the rout of the British must have been complete, and the flight from the field of battle of the most precipitate description, as its direction, proves that they had been obliged to abandon communication with their bases of operations, the three cities above-mentioned. The outburst of grief of the bard, being a purely personal expression of feeling, as handed down to us, gives us the impression that it *is* really what it professes to be, namely, an effusion absolutely synchronic with the event, of which it preserves the remembrance. As we can obtain no more succinct account of the poem and its subject, than that published by the VICOMTE DE LA VILLEMARUQÉ, in the book before referred to, a translation of his summary is here given.

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* That is, assuming Basa to mean Basing. It cannot mean a river, as supposed by Pearson, because the words of the Dirge tell us, that :—" The *Churches* of Basa are in deep mourning to-night, on receiving the remains of the pillar of the battle; of the heart of the men of Argoed."

In the first place, the bard extols the virtues of KENDELANN; his generosity, his determination, his finesse, his warlike ardour, equal to that of the Bloodhound, of the Falcon, of the Wild-Boar, of the Lion,—an ardour which inflames hearts, and attracts them to itself, alike for a festival, or for an assault. Happy the people who have for chief such a defender, when they hear the low sounds of the advancing enemy. They must close in phalanx, and fortify themselves in the high places.

Vain efforts! The foreign army composed of Anglo-Saxons, (whom the bard calls Franks,) and of Logriens, (a people of the then constitutéd England,) has triumphed over the resistance of the natives; and after having destroyed and pillaged all, departs to carry elsewhere, desolation and death.

The enemy gone, the night come, there is seen amongst the ruins made, a coffin, in a large empty hall, sombre, silent, fireless, and roofless, open to all the winds of heaven, and near the coffin, the bard, watching and weeping. Whilst he thus watches, piercing cries reach his ear in the silence of the night. It is the voice of an eagle of the mountain, red with the blood of KENDELANN, in which it has quenched its thirst, and with the blood of other slaughtered warriors, into which it plunges voluptuously; then there is the voice of a second eagle, perched on the top of the palace of the British chief, which asks for his flesh to devour.

From the funereal hall, the bard accompanies the body of KENDELANN, to the church where the prince has to be interred, and where have been deposited, the remains of his companions in arms. Amongst these, are found several of the inhabitants of a town in course of erection, (en construction,) called the *White City* (la Ville Blanche), of which the walls, incessantly sprinkled with the blood of its natives, have probably never been finished. He addresses the heroic sisters of KENDELANN, whom he calls *his* sisters, several brothers of the British chief, whom he calls *his* brothers, and, finally, the hero KERANMAEL, whom he celebrates next after KENDELANN. When he has thus discharged the duties of fraternal piety, he resolves to fly to solitude, thinking that he already feels the cold lance of the Saxon, who will shortly come to give to the flames, the church which serves as the asylum of the illustrious dead, whose praises he has sung. But the blood of so many victims, above all, that of KENDELANN and his sisters, whose names the bard is pleased to repeat so lovingly, will finally not be shed in vain: a mysterious, and invincible warrior, will soon present himself at the head of a numerous army, and will avenge the Britons. Such is the theme of the elegy. The author concludes by addressing pathetically, the young daughters of the British Isle, whom he invites to the heart-rending spectacle, of the palace of KENDELANN, and the whole country, in flames.

I have never seen this poem alluded to in any of our county histories, but as it embodies the British record, of one of the bloodiest, and most important battles of the period, fought within our borders, and the last wail which has reached our times upon the expulsion of the Britons from them, I have thought it worthy of your notice, and subjoin a translation of that portion of it, relating to the "White City," which I suggest must have been Sherston.

TRANSLATION OF PART OF SECTION V.

"The White City in the bosom of the wood, since it has been built, always (has seen) blood upon its herbage.

"The White City from the time that it was being built (has seen) its green enclosure in the blood beneath the feet of its warriors.

"The White City of the valley would rejoice at the termination of a fortunate fight; (but) its inhabitants, are they returned?

The White City between Trenn and Trodonez was more accustomed (to see) the broken buckler returning from battle than the ox in repose.

"The White City between Trenn and Traval, was more accustomed to see blood upon its pastures than its fallows tilled.

"Oh Frener,[*] what unhappiness, what anguish, this night after the loss of relatives! It is through the fault of my tongue that they have been slain."

The following are the extracts from the "Maronad KENDELANN mab KENDROUEN," referred to, as given by the VICOMTE DE LA VILLEMARQUÉ:—

BRETON. V.

E trev gwenn, enn bron ë koed,
Ez ev eo he ervraz, eirioed
Ar enep he gwelt ë gwaed.

E trev gwenn, enn ë tempeir
He ervraz, he glas beveir
E gwaed adan traed he gouir.

E trev gwenn, enn ë defrent
Laouen e bezer, ourz kevamuk kad;
He gwerin n'er derint?

E trev gwenn, rong Trenn ha Trodouez
Oez gnodac'h eskoned ton
Enn deuod oc'h kad, na ged eic'h enn ec'hoez

E trev gwenn, rong Trenn ha Traval,
† Oez gnodac'h er gwaed . . . . . .
Ar eneb gwelt, nag aredik braenar.

WELSH VERSION, FROM THE MANUSCRIPT OF HERGEST.

Y dref wen yn mron y koed
Ys ef yw ei heuras eiroed
Ar wyneb ei gwellt y gwaed.

Y dref wen ynyt hymyr
Ei heuras ei glas fyfyr
Ei gnaet adan draet ei gwyr.

Y dref wen yn y dyfrynt
Lawen y byddair wrth gynanrud kad
Ei gwerin neur derynt.

Y dref wen rhwng Tren a Throdwyth
Oed gnotach ysgwyd ton
Yn dyvod o gad no gyd ych y echwyd.

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[*] Frener was the sister of Kendelann.

† A word is wanting here in all the manuscripts.

Upon the first five stanzas quoted, we may remark that they are distinctly addressed to a place of some importance, near the scene of conflict, which had sent forth its fighting population to swell the ranks of the British army, and that this place was called, in the old British language, " Dref wen,"=the "White City." Its importance as a military position, may be estimated from the frequent attacks to which it had been subjected, from "the time that it was being built," until the time of the battle which so much affected its fortunes. The circumstance of its not being specially mentioned in the *Saxon Chronicle*, with the cities of Gloucester, Cirencester, and Bath, may be attributed to its insignificance, in comparison with those great Roman-British stations. The operations of the inhabitants referred to, as being so persistently interrupted by attacks of enemies, were probably endeavours to repair, extend, or improve the old Roman-British fortifications. The wood, in the "bosom" of which we are told that it was situated, must have been the present Selkwood, which would then have naturally exceeded its present boundaries, and probably surrounded the town. In proof of its Roman occupation, many coins and other remains have been found here, and the remaining traces of fortifications tell their own story; moreover we know no other place in the vicinity of the battle-field, to which the name of "city" or "town" could be so fitly applied.

Bearing in mind, that LLYWARCH's appellation of "Dref wen",* corresponds in a remarkable manner with the name which common tradition asserts to have been given it in pre-Saxon times, I believe that I am advancing no forced theory, in supposing Sceorstan,†—Sherston, to be the "White City" of the old bard's elegy. In this opinion, I am confirmed by the etymology of the Saxon name, as it at present stands. The first syllable is merely a variant of the Anglo-Saxon Scir, Scyr=Sheer, the meanings of which, according to Lye,* are "clarus, *nitidus*, limpidus, lucidus, *albus*, merus, &c. In the second syllable, substituting for the *stan* of the *Chronicle*, the *ton*, of actual speech, we have the precise translation into Anglo-Saxon, of the older British name, which I consider sufficiently conclusive, as regards the correctness of my supposition.

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* Modern Welsh—Tref gwyn.

† Sceor-stan was the Anglo-Saxon form of Shire-stone, the stone which marked the junction of the boundaries of the counties of Oxford, Gloucester, Worcester, and Warwick, and so occurs in the *Chronicles*. When recording the battle between Edmund Ironsides and Canute, which took place at Sherston, the village, several centuries after its possession by the Saxons, the scribe, writing phonetically, probably adapted the name of the one well-known locality, to the other,—possibly confounding them with each

In the sixth stanza, in which the bard apostrophises FRENER, one of the slaughtered sisters of KENDELANN, he repeats a statement which he has previously made in the same composition, accusing himself, "through the fault of his tongue," of having brought about the catastrophe which he deplores; from which we way infer that he had precipitated it, either by the unfortunate exercise of his influence in council, as a leader, or by his impassioned appeals to his fellow-countrymen, as a poet. The Trenn, which he mentions, both as a river, and as a town, the "cradle," or birth-place, of KENDELANN, is supposed, with good reason, to be the present township of Tern, in Shropshire, which

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other. The only other Anglo-Saxon roots which I can find as possible substitutes for Scir, Scyr—Sher, are:—

Seara—Snares, an Ambush.

Searo—Deceit, Wile, Instruments, Arms.

Searu } Device, Wile, Fraud, Treachery, Art, Contrivance, Work,
Seorwæ } Machine, Warlike Engine.

These words from Bosworth's Anglo-Saxon Dictionary, are clearly identical in signification, and also in sound, to any uncultivated or uncritical ear, and differ in form only, from the indiscriminate use of the terminal vowels, of which they are by no means rare examples. Adding to either of these. the genitive-forming s, we have Searas, Searos, &c., &c. Stan, or Ton,="the Stone, or Town of Treachery," or of warlike works or appliances. Supposing that we adopt either of these significations, the first can only refer to some incident in the history of the place, of which we have neither record nor tradition; and the second, (which must require ton, not stan), would suggest that our Sherston, was the "town of *Forts*," alluded to as fallen in another unquoted portion of the elegy.

* Dictionarium Saxonico et Gothico-Latinum. London, 1772. 4to.

is situated upon an affluent of the Severn, of the same name. In the sixth section of the elegy, he refers to it in these terms:—

> "They have all been killed at one time, my brothers Kenan, Kendelann, and Kenvrez, in defending Trenn, the desolate city.
>
> "They trampled not with impunity upon the cradle of Kendelann; he drew back not a footstep; his mother has not nursed a degenerate son."

He again says, in section VII, apparently referring to this place:—

> "The very wonderful fortress, (henceforth levelled with the ground) is no more! Henceforth for us is no other refuge than the cover of the thick woods, where hunger (reduces us to the state of) the wild boar, unearthing the roots of wild plants."

Upon referring to the various authorities upon Shropshire Antiquities, which are the most accessible, I find no allusion to Tern as a place of the slightest historical interest, which fact I think, is fair evidence of the correctness of the bard's account of its total destruction, and "levelling to the ground," as, had any trace of its ramparts remained, they would surely have attracted the attention of modern Archæologists.

As Trenn in Welsh means simply "rapid," it is not unlikely that there may have been other streams, or places, so called, within the area occupied by the Britons. The river Trent, doubtless derives its name from the same root. From its particular mention in this poem, it must clearly have been laid waste some time previous to the battle of Dyrham, whence we may infer, that KENDELANN had at that time, been effectually driven out of his kingdom of Powys, and had been forced by circumstances beyond his control, to cast in his lot with that of his neighbouring fellow-sovereigns, in their final struggle, not only for independence, but for existence.

It appears also, from the stanzas quoted, particularly the last, that not only was the bard's return to Trenn, or Powys, considered hopeless, but that the men of the White City could not return to their home, and must wander as fugitives, concealing themselves in the woods, and living, like wild boars, upon roots, like himself.

Nowhere else, can we find such graphic, or sad accounts, of the terrible miseries and privations, to which the Britons of our part of the Severn Vale, and their allies, were reduced, or of the absolute dominion, over the area indicated by the names of the three captured cities, acquired at one stroke by the Saxons, as recorded in this contemporaneous elegy. There are many other passages in it, upon which I am almost tempted to dilate, which throw a little light upon this obscure portion of our national history, but I find that my paper is already much longer than I intended to make it; I therefore conclude, with the hope that I may have interested some of my old colleagues, by bringing under their notice, the oldest document known to me, as relating to our county, since the Roman period,—this old British poem of LLYWARCH HEN.

J. JONES.

London, Sep. 24, 1875.

On the Ancient Camps of Gloucestershire. *By* G. F. Playne, F.G.S.

Read at Chepstow, May, 1875.

The rambles of the members of the Cotteswold Club on the occasions of their Field-meetings frequently bring them to one or another of the ancient Camps of Gloucestershire, and incidental notices of such Camps are to be met with scattered through the leaves of the Proceedings of the Club. Some of our County Historians also, in their descriptions of the objects of interest contained in various parishes, have noticed many of these ancient earthworks; but such occasional visits and incidental notices fail to give a comprehensive view of this subject.

In a paper brought before the Club in 1870, "On the Early Occupation of the Cotteswold Hills by Man," I confined my observations almost entirely to a description of the ancient earthworks, and their associated stone implements, as they are found in a small area of 25 square miles in extent, and now desire to extend the subject to the whole county.

As far as I am aware no writer has treated this subject so as to embrace the Camps of the whole of Gloucestershire; very much has been written on the subject, but generally only a portion of these works has been brought under review at one time; by some writers *isolated groups* have been described, by others *chains of Camps* have been traced; but in such ways many Camps have been unnoticed, whilst undue importance has been given to others.

The Camps of Gloucestershire are scattered from north to south, and from east to west, but for convenience I will speak of them under the three natural divisions into which our county falls, and

1stly. Of those found on the Cotteswold range from Saintbury at the north, to Lansdown at the south, and from the western escarpment back to the eastern limit of the county.

2ndly. Of the Camps found in the Vales of the Avons and the Severn, and lying between the Cotteswold Hills and these rivers.

3rdly. Of the earthworks which can be traced between the Severn and the Wye.

The following tables will give an idea of the large number of these ancient Camps of which traces still exist, and a reference to the accompanying sketch map will show their relative positions:—

(To avoid dividing the Tables they are given over leaf, facing each other.)

1st. CAMPS ON THE COTTESWOLD HILLS.

No.		Class	Acres	Rudder	Baker
				Page	
1	Earthworks at Saintbury	...	...	635	
2	Camp above Willersley	...	...	823	
3	〃 above Stanton	...	...	688	
3a	〃 above Hayles	...	...	...	
4	Batsford Camp, near Moreton-on-Marsh	...	...	265	
5	Eubury, near Condicote	1	6	...	
6	Camp at Condicote	5	2	...	
7	Icomb Camp, near Stow-on-the-Wold	1	...	...	
8	Camp on Nottingham Hill	1	120	369	*
9	〃 on Cleeve Hill	2	9	369	*
10	〃 east of Charlton Abbots	5	2	...	
11	〃 at Bourton-on-the-Water	4	60	303	
12	〃 at Cold Aston	...	...	238	
13	〃 on Leckhampton Hill	1	3	...	*
14	〃 on Crickley Hill	1	9	...	*
15	〃 on Birdlip Hill	1	1	...	
16	Norbury, above Colesbourne	3	6	383	
17	Norbury, near Northleach	3	80	579	
18	Camp near Windrush	5	3	830	
19	〃 on Cooper's Hill	1	3?	...	*
20	Kimsbury, or Castle Godwin, above Painswick	...	8	592	*
21	Camp on Haresfield Beacon	1	20	...	*
22	Pimbury, near Sapperton	1	1	424	
23	Intrenchments near Bagendon	...	...	258	
24	〃 〃 〃	...	...	...	
25	〃 on the Coln	...	...	...	
26	Ladborough Camp, near Aldsworth	...	10	480	
27	Earthworks on Selsley Hill	...	30	...	
28	Uley Bury	3	30	782	*
29	Earthworks on Rodborough Hill	...	...	...	
30	Camp at Amberley	2	60	468	
31	〃 at Minchinhampton	2	600	468	
32	〃 near Frampton-Mansell	2	...	642	
33	Trewsbury, near Coates	1-2	7	392	
34	Caer Ceri, now Cirencester	...	...	343	
35	Ranbury, east of Cirencester	3	20	343	
36	Drakestone, on Stinchcombe Hill	1	$\frac{1}{16}$	...	*
37	Blackenbury, on Westridge	1	8	...	*
38	Camp, south of Nailsworth	...	6	...	
39	The Castle at Tetbury	...	5?	727	
40	The Castle at Horton	1	9	503	*
41	Camp above Sodbury	4	12	676	*
42	〃 near Dyrham	1	18	427	*
43	Ancient Camp, north of Marshfield	...	...	...	
44	Hebdown Camp, 〃 〃 〃	...	...	...	
45	Earthwork on Tog Hill	...	...	...	
45a	〃 〃 〃	...	...	...	
45b	Camp ? near Granville Monument	...	8	...	
45c	Camp above North Stoke	1	12	...	
45d	〃 on Lansdown	4	1	...	
45e	〃 on Little Salisbury Hill	3	18	..	
45f	Bury Hill, east of Marshfield	1	25	...	
45g	Camp on Mount Sylla	1	...	...	
45h	Woodbury, Castle Combe	1	8	...	
45i	Camp near Great Sherston	1 ?	...	...	
45k	Whitewalls, on the Foss Way		...	...	
45l	Malmsbury		...	...	
45m	Chastleton, east of Stow-on-the-Wold	5	...	...	

2nd. CAMPS BETWEEN THE COTTESWOLDS AND THE SEVERN.

No.		Class	Acres	Rudder Page	Baker
46	Camp on Meon Hill	3	30	614	
47	Penbury, on Bredon Hill	2	10?	506	*
47a	Camp above Conderton, on Bredon Hill ...	...	...	...	
48	Towbury, near Twining	3	20	780	
49	Churchdown Hill	...	...	...	*
50	Caer Glow, now Gloucester	...	...	82	
50a	Hempstead, south of Gloucester	4	6	...	
51	Earthworks on Long Cam Down	...	...	...	
52	Blizbury, south of Berkeley	3	1	...	
53	Camp in Michaelwood Chase	5	1	...	
54	Bloody Acre, in Tortworth Park	...	4?	...	*
55	Oldbury-on-Severn	...	10	755	*
56	Camp near Elberton	...	2?	437	*
57	Castle near Tytherington	1	5	766	? *
58	Camp in Knole Park, near Almondsbury ...	...	...	222	*
59	Bury Hill, near Winterbourn	3	...	536	*
60	Oldbury, near Stapleton	...	...	693	
61	Camp on Doynton Rocks	2?	...	406	
62	Bury on Doynton Rocks	2?	...	406	
63	Castle on Blaize Hill, Henbury	3	6	491	*
64	Camp on King's Weston Hill	1	5	491	*
65	Camp on St. Vincent's Rocks, Clifton ...	2,3,4	2?	376	*

3rd. CAMPS BETWEEN THE SEVERN AND THE WYE.

No.		Class	Acres	Rudder Page	Baker
66	Intrenchments at Symond's Yat	1	650	...	
67	Camp above Littledean	5	$\frac{1}{8}$	...	
68	Camp at Sowdley	1	$\frac{1}{8}$	...	
69	Camp at Stow Green	5	$\frac{1}{8}$	...	
70	Camps in Lydney Park	5	$\frac{1}{8}$ & 1	525	
71	Combesbury, near Tidenham	5	$\frac{3}{4}$	...	
72	Camp on Yewbury	...	...	...	
73	Intrenchments above Bigswear Bridge	...	...	...	
74	Modesgate Camp, above Tintern	...	...	...	
75	Dyke above the Wye, above Tintern	...	...	...	
76	Camp at Caerwood, Llancaut	1	20	...	
77	Earthworks at Sedbury Park	...	...	762	
78	The Bulwarks, Beachley	..	...	762	

Before giving separate notices and descriptions of each of these works, it may be mentioned that, as regards their forms, the greater number can be referred to one or another of the following five groups :—

1st. The most common form is that in which a projecting point or spur of a hill is cut off from the plateau by earthworks, as for example, the camp on Crickley Hill (Plate II, fig. 4), where a mound and ditch have been thrown up in a slightly curved line from north to south, the other sides of the enclosed area being protected by the steepness of their natural escarpments.

2nd. A second form is that in which a portion of a plateau is enclosed by a curved line of embankments, with the ends resting on the escarpment, as on Cleeve Hill (Plate II, fig. 11).

3rd. A hill fortified by earthworks conforming to the natural shape of the hill, as Salisbury Hill, near Bath (Plate II, fig. 12,) the level top of which has been protected with a mound thrown up all round it.

4th. Rectangular Camps, as at Sodbury (Plate II, fig. 15). Three sides of this well-known camp are protected by remarkably regular earthworks, whilst the fourth side is formed by the natural escarpment.

5th. Circular or nearly circular Camps, as Windrush Camp (Plate II, fig. 19.)

There are some Camps whose form is referable to two or even three of these classes, as the Clifton Camp.

The diagrams on Plates II, III, and IV, are traced from the Ordnance Map, but in every case the forms or position of the earthworks are laid down after personal examination.

In the following descriptions of the Camps I shall have occasion frequently to refer to the notices which are given by Samuel Rudder, in his "History of Gloucestershire," published in 1779, to whom we are indebted for his industrious researches, accurate observations, and truthful description of so many of these works, as they existed one hundred years ago. He appears to have visited every parish of this county, and to have made inquiries into all matters of natural, historical, and antiquarian interest, including earthworks; and by this means he has preserved a record of several Camps and many Tumuli, which have since his time been levelled, built over, or otherwise defaced. In order to avoid needless quotations the foregoing table has a column of references to Rudder's "History," from which it will be seen how extensive were his researches into this subject. In another column those works are indicated which are mentioned by Mr. Baker in his paper on "A Chain of Ancient

Fortresses extending through the south-western part of Gloucestershire," communicated to the Society of Antiquaries, 1818. The table assigns the class to which the form of each Camp may be referred, and also gives the *approximate size* of the areas enclosed, as it is more useful to have these particulars in one view than scattered through the following pages. The term "Camp" is used as applying not only to its signification as a place occupied for military purposes, but also as applying to a defended position, used as a place of residence.

No. 1. Saintbury.—On the hill immediately above Saintbury Church there are traces of intrenchments, but they are only shallow ditches, extending along the brow of the hill on its north and west sides. Rudder states that this work was called Castle-bank.

No. 2.—One mile south of Saintbury are the remains of a large Camp, situate on the hill-top above Willersey. Rudder states that it enclosed 60 acres, but having now long been under cultivation, the earthworks are scarcely to be traced, except on the south side, where, near "Camp Farm," they have been preserved by having had a wall built along the top of the mound. The defence consisted of a single mound and ditch, and the mound is still six feet high on the Camp side, and twelve feet high from the bottom of the ditch.

No. 3.—Rudder mentions that on Shenborough Hill, above Stanton, "there was a large Camp, fortified with double intrenchments." It has probably been destroyed by cultivation, as it is not marked on the Ordnance Map.

No. 3a.—A projecting point of the hill above Hayles is cut off by earthworks; this Camp was visited by the Club, July, 1868, as mentioned in the "Transactions," Vol. IV, page 207.

No. 4.—Rudder mentions that there is a small Camp at Batsford, near Moreton-in-Marsh. I have not visited it, but am informed that British and Roman coins, Roman pottery, fibulæ, &c., have been found within its area.

No. 5.—Eubury is about a quarter of a mile east of Condicote, and, as its name implies, is near a water supply. This camp is on a projecting spur of the hill, having shallow valleys on three sides; one side has been protected by two lines of escarpment with a platform between them, the other side of the spur is protected by a mound. On the north a steep hill overlooks this camp, and in the narrow valley between this hill and that on which the Camp stands an earthwork has been thrown up—a mound 18 feet wide at its base, and 10 feet high, without ditches. (See Section Plate III, fig. 32.) This mound terminates abruptly at both ends, without any apparent defence to prevent an attacking force from marching round it; and this is one instance, amongst many in our ancient earthworks, where it is difficult to see the value of such defensive lines, unless the combatants are believed to have been ignorant of military tactics, or we suppose that these mounds were accompanied by stockades extending beyond the earthworks, and that all traces of these stockades have disappeared.

No. 6. Condicote Camp (Plate II, fig. 8).—This is a circular Camp, formed by a single mound and ditch; it has been partly destroyed by the erection of some of the houses of the village and by roadways. This Camp was probably formed in this situation in consequence of the occurrence here of a spring of water; all around are wild waterless "wolds," so destitute of natural sources of water that the farms are provided with the singular "dew-pools" constructed above the level of the surfaces of the fields, and fed by condensation from the atmosphere; but at Condicote a fault has occurred, by which the Fuller's Earth Clay is brought near the surface, and throws out a spring of water, the value of which, in this arid district, was attested by the erection over it of a mediæval cross.

About two miles north of Condicote there is marked on the Ordnance Map "Camp Ground." I am not aware that any remains of a Camp are left; but it is probable, from this name and the situation, that there was one in that locality.

No. 7.—Icomb Camp occupied the termination of a range of hills two miles south of Stow-on-the-Wold. Icomb is a detached portion of Worcestershire, and Dr. Nash, in his history of that county, says of this camp—"It has a single ditch, which is in many places ploughed down." At the present day no traces of earthworks remain.

No. 8.—Nottingham Hill, the northern termination of the range of hills above Cheltenham, forms a Camp (Plate II, fig. 9.) A double line of earthworks runs across the neck of the hill, and encloses a large area, more than one hundred acres in extent.

No. 9.—On Cleeve Hill, above Prestbury, there is a very interesting Camp (see Plan Plate II, fig. 11, and Section Plate III, fig. 33); a small area of about four acres is protected by very strong earthworks, formed on a curved line, the ends of which rest on the edge of the precipitous escarpment. At the well-marked entrance at the north end of this camp the earthworks are higher than elsewhere. In many parts the inner line of embankment is irregular in form, but whether this has arisen from imperfect work in its first formation, or by subsequent disturbance, is not easy to determine.

No. 10.—To the east of Charlton Abbots is a circular Camp (Plate II, fig. 20), the form of which can still be clearly traced, although the plough has nearly levelled the earthworks. It is formed by a single mound and ditch, and, as is the case with other *circular* Camps on the Cotteswolds, it derived little strength from its position, being nearly on a level with the surrounding ground. There was an entrance across the ditch and through the mound from the east.

No. 11.—At Bourton-on-the-Water there was a large Camp of about 60 acres in extent. Its earthworks have been greatly disturbed by cultivation, roads, and buildings, and even the north-east angle, which has suffered least, has had the original slopes of the banks reduced and the ditch nearly filled up; but enough remains to show that the works were there formed at a right angle. This Camp, which is half a mile east of the Foss Way, had little protection, from its position being on the level valley, and at only a very slight elevation above the river.

No. 12.—Of Cold Aston, Rudder writes—"In the camp field, on the right hand of the road leading to Bourton-on-the-Water, are intrenchments, now much levelled."

No. 13.—On Leckhampton Hill, the point of the hill-top has been cut off by an intrenchment, consisting of a single mound and ditch, on a curved line, enclosing a small area. Outside this Camp there is, on the east side, an earthwork—a slight mound encloses an area 20 yards square, in the centre of which there is a slight elevation eight yards square.

No. 14.—The point of Crickley Hill is protected by earthworks, a mound and ditch running across it on a slightly curved line. The original entrances to Gloucestershire Camps, where they are still to be traced, are usually simple openings through the mounds, with the ditch nearly filled opposite the openings, but at Crickley Hill Camp the entrance has the bank and ditch curved forward so as to protect and cover the opening. (See Plate II, fig. 4).

No. 15.—On Birdlip Hill, immediately above the large quarries, the remains of an earthwork can be traced, although nearly levelled by cultivation of the soil. It runs in a curved line, enclosing on the point of the hill a small area of less than an acre, but the protected part was once larger before the escarpment was quarried for stone.

No. 16.—On a hill-top, at a considerable elevation above Colesbourne, are the remains of a Camp, locally known as Norbury. It occupies a commanding situation, with views in one direction of narrow, winding, wooded valleys, and in another direction, across the valley of the Churn, to Penhill and the neighbourhood of Birdlip and the Seven Springs. It was enclosed by a single mound and ditch, only a small portion of which has escaped destruction, though the outline of the whole may still be traced to have been of an irregular form, crowning the highest portion of the hill.

No. 17.—One mile north of Northleach lies Norbury Camp; it occupies the ridge of a hill; the north side was defended by a mound, the south side by an escarped work, the west end by a mound and ditch, formed on a curved line, which is now nearly obliterated; the eastern defence appears to have disappeared. Rudder states that it encloses an area of about 80 acres, and that the defences were already in part destroyed in his day.

No. 18.—Near Windrush is a circular Camp (see Plate II, fig. 19), formed by a single ditch and mound, and enclosing three acres. The enclosed area is under cultivation, but the earthworks have been carefully preserved; the mound is about four feet high, with a ditch about two feet deep on the outside; there was an entrance from the south. Though nearly level with the surrounding land, it occupies the highest spot of the neighbourhood, and commands extensive views, including Barbury and Liddington Camps, on the distant Wiltshire hills.

No. 19.—On the point of Cooper's Hill an outlying portion of the Great Oolite has been preserved from denudation by having been thrown down by a fault. The value of this weather-stone has led to its being so largely quarried that the earthworks which once protected this point have been nearly removed, but a slight mound can still be traced running along the brow of the escarpment on the east side, and there are some traces of larger mounds running across the hill.

No. 20.—The Camp on the hill above Painswick, known as Kimsbury and Castle Godwin, occupies the highest spot of the hill. It is defended on three sides by earthworks, whilst on the fourth side the escarpment is very steep. The earthworks on the south-west side consist of three high and steep mounds with ditches, forming a very strong work, whilst on the remaining two sides the defence consists of a single mound and ditch. It is singular that the strongest earthworks were formed where the natural strength of the position was the greatest—the hill-side on the south-west being much steeper than on the south side, and the surface of the ground outside the eastern defence being nearly level with the enclosed area.

No. 21. Plate II, fig. 5.—Haresfield Camp is formed by a single ditch and mound, running in a curved line, cutting off the projecting point of the hill; through this line of defence there are two well-marked entrances. From the point of the hill thus enclosed a spur projects, known as Haresfield Beacon; the surface of this spur is at a lower level, and is cut off from the upper Camp by a high and very steep-sided mound, and the extreme point is defended by a series of slight mounds and ditches (see Section Plate III, fig. 31.) This spur thus formed a Camp within a Camp, and would doubtless serve as a stronghold or keep, if the outer Camp was forced.

No. 22. Plate II, fig. 4.—Pimbury, or Pinbury, occupies a point of hill projecting into the valley, one mile above Sapperton. This point was cut off from the plateau by a mound running across it, and there were also defences at the extreme point. A small mansion was built in this Camp in the last century, and the area of the Camp formed into a bowling green, and the principal mound into a terrace walk. Fine old yew trees form an avenue on the remains of the mounds which protected the point of the Camp.

No. 23.—Near Bagendon the remains of an extensive intrenched work can be traced; they have been much disturbed by the formation of roads and by cultivation, and I have to thank the Rev. W. Dyke, the Rector of Bagendon, for kindly pointing out to me their position and extent. There appears to have been a double line of earthworks, with a space of 80 or 100 yards between the two lines. They are on the west of the River Churn, and the southern extremity of the earthworks are met with on the hill above the Bear Inn, at Barrows Bridge. Here the easternmost bank and ditch have been preserved by a plantation, whilst the inner line has been levelled, but its position can still be traced. Following these works northwards, they are found to cross the marshy ground near the stream, and to ascend the opposite hill, where the inner mound and ditch are partly preserved at the side of Cutham Lane, and the outer or eastern line has been ploughed down, but its position is seen on the surface of the fields. Portions of the two lines are met with up to North Cerney House Park, from which point they curve towards the west, near Scrubditch Farm. These works thus extend for a mile and a half, and probably continued farther westward.

No. 24.—Mr. Dyke states that there is a line of earthworks half a mile east of the Churn, and directly facing the Bagendon lines. They consist of a line of earthworks, with the ditch on the western side of the mound, whilst the ditches of the Bagendon mounds are on the eastern side; so that these two works may have been constructed by opposing forces.

No. 25.—One mile north-east of Bibury there is, on the River Colne, a place marked on the Ordnance Survey "Old Intrenchment;" it appears to occupy a bend of the river, but I have met with no description of this work, nor could I obtain any information of it by inquiries at Aldsworth and Bibury; and time failed me to visit it.

No. 26.—One mile south-east of Aldsworth, near Ladborough Farm, is a Camp locally known as the "Dean Camp." Its shape is shown on Plate II, fig. 18; it is situate on a knoll above the rivulet Leach, and the earthwork consists of a mound in some parts, and in others of an escarped bank, without ditches. It is now suffering by cultivation, and an intelligent old man assured me that he remembered these earthworks to have been of a much greater strength fifty years ago, when the land on which they stood was let at an annual rent of thirty pence an acre, and there was little inducement to encroach on these ancient works.

No. 27.—On Selsley Hill there is an earthwork, consisting of *a very slight* mound and ditch, following an *irregular* line, apparently in connection with a group of pit dwellings, which are scattered over the hill top. There is another very slight earthwork near the neck of the hill, where on one side lies Penwood, and on the other side Bos-Pen, names which tell of a British occupation of this locality.

No. 28. Plate II, fig. 13.—Uley Bury is well known, and has been frequently described. It occupies the whole area of the top of a hill, detached from the adjoining range save at one point, and the fortifications conform to the outline of the natural escarpment; they are of an unusual character, the natural steep sides of the escarpment have been cut into, so as to form a terrace about 40 feet feet wide all round the hill, and this terrace has a slight mound on the outer side, forming a breastwork. The entrance from the north is strongly defended by a series of mounds running across the narrow neck of land which connects Uley Bury with the hills at that point. From the two other well preserved entrances the roadways leading down into the valley are still to be traced. The whole enclosed area of this Camp has long been under cultivation, but its deep soil retains many interesting objects;—drift pebbles are very numerous, flints chipped by man are common, but very few flint *implements* are found; several hand "mullers" have been met with, some formed of Old Red Conglomerate have the enclosed quartz crystals worn and polished by friction. Whilst the worked flints point to a very early occupation of this site, the numerous coins found within the Camp and in its immediate neighbourhood prove its later occupation by the Romans.

No. 29.—On Rodborough Hill, near Stroud, there are remains of a strong earthwork, but cultivation has left only a short length of it unlevelled; in its neighbourhood are a very large number of pit dwellings. This work and the two following Camps, namely, Amberley and Minchinhampton, with their accompanying pit dwellings, were figured and described in my former paper on this subject. (See "Proceedings," Vol. V, page 285.)

No. 30.—The Amberley Camp was formed by a slight mound and ditch running on a curved line, with the ends resting on the escarpment. A second, and probably later work, is of much greater strength, and cuts the Camp into two divisions.

No. 31.—The area of the Minchinhampton Camp is one of the largest in Gloucestershire, its defensive works consisting of a ditch and mound, run on a curved line, the ends of which are more than a mile asunder, and enclose an area of some 600 acres. On the eastern side it is further defended by three parallel lines of earthworks. A slight mound connects the Amberley and Minchinhampton Camps, and in the area thus enclosed are many hundred pit dwellings.

No. 32.—Above Frampton-Mansell there was an ancient Camp, formed by two lines of earthworks running on a curved line, enclosing a small area between them and the escarpment. It was known as the "Green Ditches," from the circumstance that the mounds and ditches remained untilled, but in a severe winter, thirty-two years ago, the tenant-farmer set his men to level the mounds, and so effectually was this accomplished, that scarcely any trace of this Camp now remains. There is a local tradition that at a spot a little way from this Camp, "there was, in old times, a town:" at the spot indicated the soil is rather darker than around it, but this is all that can be seen. May not this tradition have been handed down some sixty generations, and be founded on a fact, namely, that a British "town" occupied this place, having the neighbouring Camp as a Refuge?

No. 33.—Trewsbury, from its proximity to the Roman road, which ran south-west from Corinium, has been generally considered a Roman Camp. It occupies a slightly elevated spot, bounded on its west side by the shallow valley where formerly rose the fine spring of water known as Thames-head, but which has been diverted, and supplies, by the aid of a pumping-engine, the Thames and Severn Canal. The spring of water was doubtless of much importance in that otherwise waterless district, and may have led to the choice of this site for the Camp. The artificial defences of Trewsbury consist of two mounds, with wide ditches protecting the east and south sides, (see Plate II, fig. 10.) At the north end these embankments are only twenty yards apart, but this space gradually increases to thirty-three yards where they curve towards the south-west, and to forty-seven yards where they reach the escarpment. The mounds vary much in height in different places. There are no earthworks on the west side, the escarpment there having a steep bank; on the north the land has only a gentle slope, and, judging from the Ordnance Map, there was formerly an earthwork on it, but in the erection of a fine house and the laying out of gardens and pleasure-grounds within the area of this Camp, its earthworks have been disturbed.

No. 34.—The British town Caer Ceri, or Caer Cori, on the river Churn (anciently Corin), was doubtless a fortified position, but the succeeding Roman town Corinium obliterated the traces of its earlier occupation. The walls of the Roman town mentioned by Leland have well nigh disappeared also, though their position has been carefully traced by Professor Buckman and C. H. Newmarch, Esq., and figured and described in their work, "Illustrations of the Remains of Roman Art in Cirencester."

No. 35.—Ranbury (Plate II, fig. 17,) is situate four miles east of Cirencester, and stands on a slight elevation. It has an irregular form, and the earthworks vary much in different parts, being in some places very strong and having a wide ditch, and as much as thirteen feet from the bottom of the ditch to the top of the mound, whilst in other parts there is no mound and only a slight ditch.

No. 36.—As shown on Plate II, fig. 1, the southern point of Stinchcombe Hill, known as Drakestone, is cut off by a series of mounds and ditches, a section of which is given, (Plate III, fig. 29.) This fortified point has been considered to have been a signaling station, by which communication was kept up between the neighbouring Camps of Uley Bury and Westridge. Its commanding situation, embracing a view of so great an extent of the country on both sides the Severn, may have led to its use as a Beacon station at various times, but I think its original use was for a different purpose than either of these, for along the southern edges of the adjoining plateau, on the top of the slope of the escarpment (marked a and b on the plan) are a series of oval pits—there are 17 in this position (at a) on Drakestone, and beyond the spur of the hill which runs out towards the south-east there are (at b) 14 more. These 31 pits vary in length from eight to 14 feet, and have little depth, but the pit farthest from Drakestone is larger and deeper, being 25 feet in length and five feet in depth; this is situate just above a gulley which runs down the hill-side, and is known as "Stancombe Throat." I have only observed one pit-dwelling *on the plateau* of Stinchcombe Hill. The position of the 32 pits at the southern edge and just under the escarpment, appears to have been chosen to secure protection from westerly and northerly winds. The large pit, placed at a point where an approach from the valley might be made with the greatest secrecy, may have served as a guard or watch-pit, and is similar in character to some large and deep pits found *on the outskirts* of the assemblage of pit-dwellings on Minchinhampton Common and on Westridge Hill. The fortified point of Drakestone may have served as a Refuge to this settlement of pit-dwellers when attacked or threatened by an enemy. Within the fortified point are two shallow depressions, which may have been dwelling-places.

No. 37.—On Westridge Hill, one mile north of Wotton-under-Edge, earthworks of a very interesting character have been preserved. Until recently this hill has been covered with woods, but shortly after the investigations of the Club in 1869 had called attention to the subject of pit-dwellings, a portion of Westridge Hill was cleared of its woods and brought under cultivation, when our colleague, Mr. J. H. Cooke, observed the traces of numerous pit-dwellings, and called attention to this discovery. Since that time a larger portion of Westridge has been denuded of its woods, bringing to view not only very many of the ordinary pits, but others of a different character. At one spot, marked b on the plan, Plate II, fig. 2, there was a group of four large pits, nearly circular, one having a diameter of 100 feet, and three each about 70 feet in diameter, but running into one another; they appear to have been seven or ten feet deep, but are now filled up with stones and stools of trees. Under the escarpment at c on the slope towards the north, are five or six large circular pits, 20 to 30 feet in diameter, and now seven feet deep, and on the same slope are many of the ordinary small pits eight or ten feet long, and three feet wide. All over the plateau of Westridge there were these small pits, altogether 600 or more; they are more abundant in some parts than in others; very few on the part adjoining Nibley Knoll, which has a northern aspect, and on Nibley Knoll I have only observed one pit. The point a is strongly fortified by earthworks, running in a slightly curved line across the hill. This part is still so densely wooded that it is not easy accurately to trace out these earthworks; the section given on Plate III, fig. 30, was taken near their southern termination; at their northern termination the two mounds are nearer together. Although the pits are found close up to the outside of these earthworks, not one has been observed within the fortified area, there the surface of the ground is level and unbroken.

In the case of Westridge we appear to have preserved to us an example of a British "town," the numerous small pits may each have been occupied by a single family, the group of large circular excavations as store-houses, the circular pits under the escarpment as guard-houses, or possibly as winter-houses, whilst the strongly fortified point of Blakenbury served as a Refuge.*

No. 38.—Hazlewood Copse Camp, one mile south of Nailsworth, was described at page 285 of the fifth volume of our "Transactions," so need not again be particularly referred to; it has very slight mounds and ditches, formed on a very irregular plan, but one portion of the Camp is so constructed as to form a keep. Flint chips are found on the surface of the ground all around this district in small numbers, but close to the north side of this Camp is a spot, less than an acre in extent, from which I have gathered 2000 worked flints, including 11 arrow points, 60 scrapers, 100 flakes (some with serrated edges), and 32 cores and hurl-stones. The large numbers of flint *implements* here found, more than have been, after diligent search, gathered off several square miles round this spot, seem to point it out as a dwelling-place of the Flint-folk, having the adjoining Camp as their place of refuge.

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* Amongst a group of pit-dwellings on Westridge Hill there stood last year a woodman's hut, and as it appears to illustrate the subject of these ancient abodes, a sketch of the modern shelter is given on Plate V. It was formed by setting stout poles, with their lower ends in the ground, on a circle ten feet in diameter, with the tops meeting in a point eight feet from the ground, a covering of turf-sods neatly arranged tile-wise on the poles, formed a perfect protection from rain and wind; within lay a log of timber giving sitting room for four men. By far the greater number of pit dwellings on Westridge, on Minchinhampton Common, and on Rodborough Hill are about ten feet long, and a circle of ten feet diameter will include both pit and mound. There can be little doubt that the shelters erected over the ancient pit dwellings were similar to the woodman's hut of the present day and covered with boughs, or thatched with grass or reeds, and that the mound and pit arrangement, besides giving better drainage (on a porous subsoil) gave more accommodation than a level floor could do. The modern hut illustrates this, for whilst there is scarcely room for two persons to stand, four can be seated, and so in the ancient shelter the mound formed a seat. These small huts were not suited to have a fire *within them*, but the large circular pits such as are found under the northern escarpment of Westridge would allow of a fire being made in them, and so render them suitable for winter abodes. The hut-shelters as used by the woodmen and charcoal burners of the present day have very possibly been used in woods and forests of our county by successive generations for the last two thousand years, with scarcely any variation in the mode of construction.

No. 39.—In several historical notices of Tetbury, allusion is made to its "Castle," but no trustworthy record of a stone-built castle exists, nor have any remains of such been found. The "Castle" here was no doubt the ancient intrenchment on the south-east side of the town, the earthworks of which, RUDDER states, were levelled about one hundred years ago, and the site "improved into a kind of pleasure-ground, with plantations and agreeable slopes and walks on the side next the rivulet." The site of this Camp is now a grass field, the form of the terraced walks and slopes remain, but none of the original earthworks can be traced.

No. 40.—Horton Castle, as shown at fig. 6, Plate II, is formed by a single mound, running on a curved line, and cutting off a point of the hill; near the entrance from the north-east the bank is still 12 feet high inside, and 16 feet high outside, but the ditch mentioned by Mr. BAKER is now scarcely traceable. RUDDER says of Horton Castle, "The Camp is of square form, supposed to be Roman;" and Mr. BAKER writes of it as "an irregular four-sided figure;" a reference to the Ordnance Map will show its actual figure.

No. 41.—The well known Sodbury Camp is remarkable for the regularity and finished character of its earthworks; it is, as shown on Plate II, fig. 15, situate on the escarpment. The defences consist of two lines of earthworks, and the area enclosed is a parallelogram; and there can be little doubt that it is of Roman construction. The section shown on Plate III, fig. 35, is taken from the side of the eastern gate.

No. 42.—Dyrham Camp (Plate II, fig. 7,) is very similar to Horton Castle; it occupies a projecting point of the hill above the village of Hinton, and was defended by a single mound and ditch, formed on a curved line, cutting off the protected area from the plateau. Just below the escarpment, at the north-west side, the ground is broken into pit-like depressions; on the south side the slope below the escarpment is not very steep, and has been strengthened by an artificial scarp. On the north side of the modern road which crosses the camp, the mound and ditch are now nearly obliterated by cultivation, but the mound on the south side of the road is still a fine work.

No. 43.—About two miles north of Marshfield there is marked on the Ordnance Map an "Ancient Camp," occupying a projecting point of Great Oolite, and bounded on three sides by valleys cut down into the Fuller's-earth. Mounds still exist here, but at the time of my visit the fields were covered with nearly full-grown crops of corn, so that their extent and character could not be traced.

No. 44.—A quarter of a mile east of the last-mentioned Camp there is also marked on the Ordnance Survey "Hebdown Camp;" but on visiting the spot I could find no trace of earthworks. The site is admirably suited to have been a camping ground, as it is a projecting point, bounded on three sides by shallow valleys, in which run streamlets of limpid water, most valuable in that generally waterless district.

No. 45.—From Tog Hill, three miles to the west of Marshfield, there is a magnificent view over the vale to the high-lands about Clifton. On this hill there are remains of an ancient earthwork, now so incomplete that it is difficult to ascertain its purpose or extent. A mound has been thrown up nearly parallel to the brow of the hill, and at only a short distance from the escarpment, it has a deep ditch on the side towards the escarpment, and a shallow ditch on the other side. A short distance to the east there is a slight ditch running nearly parallel to this mound, and the space between was possibly a camping ground. A spring of water, no slight consideration in that locality, rises just below this defended position.

No. 45 a.—On Freezing Hill, half a mile south of the last-mentioned earthwork, there is another of similar character: this also is a mound with a ditch on both sides, it also runs near the escarpment. They may possibly be the remains of one work—a line of demarcation, similar to Offa's Dyke, above the Wye, near Tintern.

The following eleven Camps are not within the limits of Gloucestershire, but as they are on the Cotteswold Hills they are described to complete the review of the Cotteswold Camps.

No. 45 b.—A quarter of a mile south-west of the Granville Monument there is marked on the Ordnance Survey, as an "Ancient Camp," a very singular work. Some seven or eight acres of the hill top are covered with mounds 10 feet to 15 feet high, with narrow hollows between them. These mounds form a labyrinth or maze, in some respects resembling "Coles-pits," near Faringdon, but there the depressions are deeper and the mounds far larger; but there is in both instances the same want of plan, and a like difficulty in explaining the object for which they were constructed. In our Cotteswold example the mounds are too regular to have been the spoil-banks formed in quarrying for stone; they are in some parts of considerable length, and are so connected that the tops can be walked on for a long way without having to cross any of the hollows. There is no mound or ditch enclosing this singular maze of earthworks. If this area was covered with trees, and the works stockaded, they may have formed a well sheltered and defensible site for a large community to dwell on.

No. 45 c.—A projection of Lansdown above the village of North Stoke has been fortified by earthworks, formed on a slightly curved line cutting off the point, (see fig. 16, Plate II.) A mound and ditch run from north to south, the ends terminating at the escarpments where the sides of the hill are very steep. About the middle of this defensive line there is an entrance to the Camp, and on the south side of this entrance a second bank has been thrown up on the east side of the ditch; the portion of the defensive works north of the entrance has not a mound outside the ditch. A slightly raised roadway is traceable from the entrance leading towards the point of the hill, and on either side of this roadway there is a mound about 25 feet by 9 feet in size, and about 18 inches high, surrounded by a slight ditch. These two mounds are very similar to some on Minchinhampton Common.

No. 45 d.—Three hundred paces from the last-mentioned

Camp there is another earthwork, on the level surface of the hill. It is a very slight work, and may easily escape observation. On the Ordnance Map it is figured as a square Camp, but this is inaccurate, as it is a parallelogram, 150 yards by 60 yards in size, and consists of a mound 18 inches high, with a ditch outside. On three sides this mound is a regularly formed work, but on the north side it appears to have been left in an unfinished state. There is an entrance at the middle of the south side, and a slight depression or roadway in the corresponding position on the north side. There are several slight mounds on this hill to the north of this rectangular enclosure, but they do not appear to have been formed with any definite object. There are remains of earthworks also near the race-course on Lansdown, but they have been so disturbed by the formation of the turnpike road, and by cultivation, that their design cannot now be traced.

No. 45 e.—Two miles north-east of Bath is Little Salisbury, an isolated hill, the nearly level top of which is triangular in shape (see fig. 12, Plate II). It has been fortified by a mound thrown up all round it, conforming to the edge of the escarpment. It is a very slight work, formed of rubble-stones and earth, and is generally less than three feet in height, though at the north-east angle the bank is in one place five feet high, and it has there a slight outer defence; at the west point there is a roadway leading into the Camp, and here the banks curve inwards, so as to command the entrance. The escarpment is everywhere steep, and on the east and south-east sides is much broken by artificial pit-like depressions, some of which appear ancient, but recent quarrying for stone has disturbed the original slopes, and also the mound on the top of the escarpment at Little Salisbury, as has been the case with so many others of the Gloucestershire Camps.

No. 45 f.—Bury, two miles east of Marshfield, and two miles north of Colerne, is on a point of a hill which on two sides is flanked by valleys cut down into the Fuller's Earth, and is defended by earthworks running across the hill-top from valley to valley.

No. 45 g.—One mile east of Bury is Mount Sylla, a point of a hill similarly flanked by valleys and defended by intrenchments cutting it off from the plateau.

No. 45 h.—At Castle Combe there is a fortified position, of which a plan and description are given in the "History of Castle Combe," by G. Poulett Scrope, Esq. Mr. Scrope says it has "strong defences of earthworks, bearing very much the appearance of a British intrenched camp. It was seated on the brow of a steep hill, which juts out into the valley about a quarter of a mile above the town towards the north-west. The hill is tongue-shaped, abruptly sloping on three sides, and connected on the fourth with the flat but high level of the surrounding country. The summit, which occupies about eight acres, is surrounded by a deep ditch and mound. Three other similar trenches, cutting straight across the longer axis of the oblong area thus enclosed, divide it into four unequal compartments, one within the other. In the last, and of course strongest of these inclosures, towards the extreme point of the hill, stand the meagre remains of the Castle of Combe. The earthworks were probably constructed at an earlier period than the Castle."

No. 45 i.—Near Great Sherston, six miles north of Castle-Combe, there are the remains of a Camp.

No. 45 k.—One mile or so east of the last-mentioned is the station on the Foss Way known as "White Walls."

No. 45 l.—To the east of "White Walls" lies Malmesbury, this site, with its steep hill nearly surrounded by the river Avon, was in all probability a fortified position at a very early date.

No. 45 m.—Four miles to the east of Stow-on-the-Wold is a remarkable work, which, though outside the boundary of our county, must not be omitted as a Cotteswold Camp; it is situate on a hill above Chastleton, on the level plateau, and consists of a single mound enclosing an oval or nearly circular area of about 12 acres. The mound is a fine work, some 45 feet wide at its base and 12 feet high, and without a ditch; there are entrances from the east and from the west. This Camp has a striking appearance, with its steep-sided high bank, covered with trees and thorns, contrasting strongly with the neat and trim cultivated lands around it and within its area.

Having briefly described the ancient Camps of the Cotteswold Hills, I will proceed to enumerate those found between the Cotteswolds and the rivers Severn and the Avons.

No. 46.—At the north of our county, a few miles south of Stratford-on-Avon, is a fine isolated hill, on one side of which lies the village of Meon. Meon Hill may be visited by taking rail to Long Marston Station, whence a walk of two miles will lead to the summit; here a magnificent view is a reward for a somewhat fatiguing ascent, the finely cultivated lands of Warwickshire, Gloucestershire, and Worcestershire are spread out, map-like, far below, the fine bold Bredon Hill and the more distant Malverns are seen to the west, whilst on the south lie the picturesque Mickleton Hills, and the sterner Cotteswolds above Saintbury and Broadway. The summit of Meon Hill has been fortified as a Camp, and the earthworks can still be clearly traced on the south and west sides; but the whole hill-top has been under cultivation, and the works have suffered in consequence. I can find no remains of earthworks on the other sides, but the plough has probably obliterated mounds on the east, whilst the north side has a very steep bank below the escarpment. The earthworks have a very irregular outline, conforming in bold curved lines to the edge of the escarpment. Even the mounds which remain appear to have been ploughed over, except at the north-west angle, where, fortunately, for about 40 feet in length they have escaped, and from this portion their plan can be seen. As at Uley Bury, there is here also only a very slight mound on the edge of the escarpment; below the edge of the hill, the slope has been artificially scarped, giving a very steep bank, 18 feet high from the bottom of the ditch; then follows a steep-sided mound eight feet high, and then a third mound five feet high.

No. 47.—Bredon Hill, so conspicuous in the landscape at the north of our county, has on its highest part a fine Camp, formed on the almost precipitous brow of the hill by two lines of earthworks, which run on curved lines, the ends of which rest on the edge of the escarpment (see Plate III, figs. 21 and 36). The outer line is nearly 100 paces from the inner; both have deep ditches and high mounds, the top of the mounds being in some parts still 20 feet high from the bottom of the ditch. The area protected by the inner line of earthworks must have formed a keep or stronghold even after the outer defences had been carried. In the inner Camp there is on the brow of the escarpment a hollow place, in which lies a mass of stone which from its singularity has attracted much attention; it is known as the "Bambury Stone,"—the Ordnance Map has it "Banbury," RUDDER writes of it as "a stone of a prodigious magnitude, which the people of that neighbourhood call Benbury Stone," and he gives its signification as the stone at the top of the hill, or head of the Camp. Thus a gradual change in the name has taken place in the last hundred years. Was it not originally *Pen*bury—the Camp of the Head?—a name so well expressing the situation of this Camp, a description of its situation to be appreciated when, after a toilsome walk from Beckford on a continuous ascent for three miles up the southern slope of Bredon, the edge of its northern escarpment is reached, and an uninterrupted prospect of the vale bursts on the sight, a prospect which includes the distant spires of Coventry. As to Bambury Stone, it is a mass of the Inferior Oolite, of which the hill-top consists, not a solid stone, but a mass of rubbly stone, cemented by infiltrated carbonate of lime. It is probable that a cave, natural or artificial, once occupied the site of this hollow place, having its entrance just below the escarpment, and that these stones, now cemented into a mass, formed a portion of the roof of the cave, and on the falling-in of this roof, this mass of stone was left in its present position. In many instances where small cave-like quarries are made in the Inferior Oolite, the strata forming the roofs, though composed originally of loose rubble, become thus compacted by the infiltration of lime. The name Benbury or Penbury, as applying to this Camp, probably existed long before this "stone" was exposed to view.

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Naturalists' Field Club, informs me that on the north side of this Camp where it is protected only by the rocky escarpment, a land-slip occurred about half a century ago, which disclosed a quantity of charred corn that had been stored in a cavity or magazine, probably for the use of the occupiers of the Camp.

There is on Bredon Hill another Camp, but it lies in Worcestershire: it is situated above the village of Conderton. Dr. Nash, in his Collections for a History of Worcestershire, described it as an oval Camp, but it has on the Ordnance Map an irregular figure given it.

No. 48.—The next Camp to be mentioned is Towbury, situate about three miles north of Tewkesbury. To reach this from Penbury on Bredon a long descent of two miles is made before the level vale is reached at the village of Westmancot, then passing through the Worcestershire village Bredon, and crossing the river Avon by ferry-boat at Twining, Gloucestershire is re-entered. Leaving the village of Twining Green, with its picturesque cottages and fine old trees, and threading a network of roads, Towbury is at length reached. It stands on a slightly elevated hill in the midst of cultivated fields and rich orchards, and is in form and position very similar to Ranbury, east of Cirencester. On the south-east side the defence consists of a deep ditch with a very slight mound above it; at the south-east angle the defence is more complex, having a double mound. The defences run round the nearly level top of the low hill, and enclose about 20 or 25 acres. Rudder mentions Leland's notice of Towbury as follows:—"It is a two miles from Theokesbyri, above it, *in ripa leva Sabrinæ.* It is now overgrown with trees and bushes of Juniper. It longged to Winchelcumbe Abbey, peradventure it was King Offa or King Kenulphus House."

The termination of Tewkes*bury* denotes that its site has been a fortified position.

The isolated hills of Oxenton and Dixton, which rise out of the vale north of Nottingham Hill, are stated "to have indications of ancient earthworks on them."

No. 49.—Churchdown has been described as a Camp by Mr. Baker in his communication to the Society of Antiquaries, "on a chain of ancient fortresses, extending through the south-western part of Gloucestershire." Mr. Baker writes—"Its shape is very irregular, conforming entirely to that of the ground. It is rendered very imperfect by stone-digging, and little or nothing satisfactory can be said of it." I have been unable to trace any artificial defensive earthworks on Churchdown, but this hill has been left by the denuding agents which have acted on it with a very remarkable surface and outline, bold knolls have been left so steep-sided and so regular as to appear like artificial mounds, whilst a large level space in their midst has an appearance of being defended by these mound-like ridges. When seen from the south, from the neighbourhood of Hucclecote, on the Ermine Street, Churchdown Hill has the appearance of a vast fortress, the ledges of Marlstone standing out form narrow terraces, with steep banks below them, from these terraces rise rampart-like mounds, with moat-like hollows between them. From its commanding position in the vale, and its natural strength, Churchdown Hill was probably occupied occasionally by the early inhabitants of our county, but the nature of its soil—the damp tenacious Lias—must have rendered it unfit for a permanent camping ground.

No. 50.—The site of the present City of Gloucester was no doubt a fortified position under the Britons, being their Caer Glou; the walled Camp or city—the Roman Glevum—which succeeded its earlier occupation, was a very regular work, traces of which have from time to time been found in digging for the foundations of houses and other works, and very interesting discoveries have lately been made by our colleague Mr. John Bellows on the line of the north and east wall of the Roman town.

No. 50a.—At Hempsted, one mile south of Gloucester, there is a very regular Camp, a parallelogram, enclosing an area 200 yards by 110 yards, which has been described by Canon Lysons, and from the remains associated with it, there is every reason to regard this as a Roman work.

No. 51.—Cam Long Down is a hill standing but little in advance of the Cotteswold range, being only half a mile to the west of Uley Bury. The top of Cam Long Down was composed of Inferior Oolite, but it has been so removed by quarrying that only a small portion of this stratum remains. The portion which remains is at the eastern end of the hill, and the surface of this is covered with pits, except at the extreme end of the hill-top, which has been hollowed out, leaving a slight mound as a breastwork on the south side. Some of the pits are circular. At the top of the section formed by the present quarry the soil is seen disturbed to the depth of three or four feet, and the pits and their sides may there be seen in section. This disturbed soil and rubble contains worked flints, some of them flakes with sharp edges well preserved. This steep-sided hill was evidently a station of a pit-dwelling people, and though the defensive work—the parapet on the edge of the escarpment—is very slight, it must rank as one of the ancient Camps of Gloucestershire.

No. 52.—The name on the Ordnance Map "Blizbury Farm," three miles south-west of Berkeley, suggested the probability of finding a Camp in that neighbourhood, and I am indebted to Mr. J. H. Cooke for examining the locality. He finds that the top of Blizbury Hill is fortified, and an area of rather more than an acre in extent, and oval in form, has been defended by having the already steep sides of the hill scarped, so as to form a steeper bank six or eight feet high; to this enclosed area there is an entrance protected by mounds. This Camp commands a wide view of the surrounding low lands of the vale, and of the opposite shore of the Severn.

No. 53.—At the south-east corner of the present limits of Michaelwood Chase, on the extremity of a hill whose southern slope runs down to the banks of the Berkeley Avon, near Damery Bridge, there is a small Camp, to which the attention of the Club was called in 1871, by Mr. J. H. Cooke. It has an irregular oval shape, about 160 yards long and 40 yards across; the defences are of peculiar construction, inasmuch as they consist of a ditch running round the enclosed area on the slope, just below the level part, and there are no mounds except such as are left by the formation of the ditch, and thus these mounds are on the *outside* of the ditch.

No. 54.—In Tortworth Park there is a remarkably fine Camp, known as "Bloody Acre;" the hill on which it has been formed has a long and narrow top, nearly level from north to south; the hill side towards the east is very steep, and slopes down into the valley, in which a lake has been made; the hill side towards the west is less steep. The Camp stands on the level part, and is defended by a high mound, running from the escarpment of the east side across the hill top, then curving round and running nearly parallel to the escarpment, and again curving round to the eastern escarpment. The north end of the Camp is narrower than the south, and is fortified by a second mound, running across the hill top. The south end of the Camp is fortified by two more mounds and ditches, running across the hill, (see Plate III, fig. 28). The earthworks are formed of the hard rock dug from the ditches, and have maintained their original forms better than any other Camp in Gloucestershire. The three mounds which form the southern defences have a very fine appearance, having graduated heights and strength, the outer line being about 10 feet from the bottom of the ditch to the top of the mound, the second line about 15 feet, and the third 20 feet. The material for the mound on the west side of the Camp appears to have been taken from the inner side, for the area of the Camp adjoining the west mound is slightly hollowed out, and there is not a ditch on its outer side.

No. 55. Plate III. fig. 27.—At Oldbury-on-Severn there is a small stream the lower part of which where it enters the Severn being of considerable width when the tide is in, forms a small harbour or "Pill," as such river mouths are called on the Severn sides. On the south side of this stream, at about half a mile distant from the Severn, there is a small conical hill on the top of which stands the church. Round the churchyard there are slight appearances of artificial embankments, and I am informed that the mound on which the church is built is an *artificial* mound, and that this is found to be the case when graves are dug close to the church. On the north side of the stream, directly opposite the hill on which the church has been built, and one third of a mile from it, there are the remains of a large Camp. This Camp, locally known as "The Toots," is situate on a slight elevation, and is formed by a mound and ditch. Rudder states that in his day this Camp was already much disturbed, and although farm buildings and cottages now occupy a considerable part of the enclosing line of intrenchments, enough remains to show it to have been a very fine work. At the south angle the ditch is broad and some twelve feet deep, and has bold yet graceful lines. The ground outside this south part of the Camp is much broken, as if by foundations of buildings, especially near a fine old tree, called "Battle Elm." There appears to have been a road from this Camp to the hill on which Oldbury Church now stands, and there was until recently a very ancient bridge across the stream. There can be little doubt that these two works were made in connection with the harbour, and that the smaller work which overlooks the Severn, served as a "look-out," or beacon-station.

No. 56.—The ancient Camp at Vineyard Brake occupies a projecting point of a hill a little to the east of Elburton, it commands a fine view of the Severn.

No. 57. Plate III, fig. 22.—Near Tytherington a projecting spur of the hill has been taken advantage of for the formation of a Camp, now called "The Castle," or "Castle Hill." In shape it is very irregular, for the greater part conforming to the natural outline of the hill, and having little or no artificial defences where the escarpment is steep; where the adjoining surface is on a level with the enclosed area of the Camp it is defended by a single mound and ditch, the mound is in some places still eight feet high from the bottom of the ditch, and there are traces of lime-mortar on the top of the mound, which seems to indicate that a wall once occupied the crest of the mound.

No. 58.—In Knole Park, a little south of Almondsbury, is another ancient Camp, which Rudder writes of as "a fortification of a rampire and a double ditch," and Mr. Baker as conforming to the shape of the ground. This Camp commands splendid views of both shores of the Severn and of the country lying beyond the Wye.

No. 59.—Two miles north-west of Mangotsfield is a Camp on Bury Hill, which Rudder mentions as having a deep foss and high agger.

No. 60.—Of Oldbury Court, near Stapleton, Rudder states that near this mansion is a small Camp on the hill.

Nos. 61 and 62.—At Wick, near Dointon, there is a spot attractive alike to the geologist, the antiquarian, and the lover of the picturesque. The little river Boyd here runs in a deep ravine, with almost perpendicular rocks rising on either side of it. At the top of these rocks there were ancient Camps, and that on the west side is still traceable, but there is now nothing left of the Camp on the east side, though Rudder distinctly states that there were intrenchments on both sides of the river; it probably occupied the highest part of the ground, and so was just opposite the Camp on the west side, and has been entirely destroyed by the large quarry since worked there. In many respects this locality is a miniature of Clifton, the river winding through a narrow gorge, the highly inclined strata of Carboniferous Limestone rising up wall-like from both sides of the stream, the highest spots of these rocks occupied by ancient Camps, and in other parts where the rocks and banks are less steep there are picturesque woods and tangled brakes.

At Bitton, four miles south-west of Dointon, considerable traces of the Roman occupation have been met with, and close to the village are the remains of a Camp apparently about 100 yards square, but the earthworks have long since been disturbed.

No. 63.—Blaize Castle is a conical hill near Henbury, of which Rudder writes, "on the summit of this hill are strong lines of fortification;" and Mr. Baker says, "on the south side this hill is impregnable from its steepness, but on the others it has been defended by at least two banks and ditches, which are now overgrown with wood and not easy to be traced. An old stoned road, called the Foss-way, is observable on the north-east side, at the top of which is an entrance, and there is another entrance towards King's-Weston Hill." At the present time there is no evidence of such important earthworks; this hill is a naturally strong position from the steepness of its sides, for at the south the rock is a precipice, and the west and east sides are very steep; a careful examination leads me to believe that there were never any earthworks formed on these three sides, and that the only artificial bank is one on the north-east side, not made on the edge of the escarpment, but on the slope of the hill-side, a short way down; at first sight this slope from the escarpment appears like an artificial work, but it is really natural; it is between this slope and the earthwork that the road runs mentioned by Mr. Baker, and leads up into the Camp. The difficulties of tracing earthworks all overgrown with tangled coppice interlaced by briars and thorns needs to be experienced to be fully realized, this difficulty is more than once alluded to by Mr. Baker, and it is met with at the present day in several of our old Camps, especially in some in those lying to the west of the Severn.

No. 64. Plate III, fig. 23.—" Scant a bowshot" from Blaize Castle rises the eastern end of King's-Weston Hill, the point of which has been formed into a Camp by a mound and ditch, (rather a slight work, the mound being only five feet high), this earthwork runs across the hill for 55 yards, and then along the south-east side for 75 yards, the remaining sides are undefended, but are quite steep. Less than two furlongs from this Camp there is another slight mound and ditch running across the hill-top.

To the east of King's-Weston Hill lies Coombe Hill, marked c on fig. 23, Plate III; Rudder says there is a Camp on its summit, but I can find no trace whatever of earthworks there. It is a situation well suited for a Camp, having a fine level top, and presenting very steep sides to King's-Weston Hill, and to Blaize Castle.

No. 65.—A small but very interesting Camp crowns the highest point of the precipitous St. Vincent's Rocks at Clifton, near Bristol. The works were very regular and very strong, but of late they have been a good deal disturbed. There were three strong mounds and ditches running round in a curved line from the edges of the precipitous escarpment, these mounds were very near together, with the ditch only between them.

Within this strong fortification formed on a curved line are some slight mounds formed on a rectangular plan, suggesting a Roman occupation of an earlier work. The southern part of these earthworks has been destroyed in making the approach to the Suspension Bridge, and the northern banks have also suffered in laying out public walks. In "The History and Antiquities of the City of Bristol," by WILLIAM BARRETT, F.S.A., published in 1789, a carefully drawn plan of this Camp is given, as well as of the two fine works which crown the hills on the Somersetshire side of the Avon, opposite the Clifton Down Camp, namely, Stokeleigh Camp, and Rownham Hill Camp. The relative positions of these three Camps are shown on Plate III, fig. 24.

Having now enumerated the ancient Camps which are found on the east side of the Severn, it remains to mention those lying between that river and the river Wye.

Coneygree Hill, Bromsberrow, has been regarded as an ancient Camp, but from a careful examination this appears to be an error. On its summit there is an artificial mound, possibly an oval tumulus, and there is a pathway running round the hill and gradually leading up to the mound on the top, but there are no fortifications.

No. 66.—At Symonds Yat the river Wye in its winding course embraces a fine promontory, and this promontory is defended by earthworks (see Plate IV, fig. 42). These earthworks ran from the precipitous escarpment on the east down to the rocks above the river on the west, and consist of four lines, as shown in section Plate III, fig. 37. These lines are not parallel. At the part represented by this section the defence consists first of a ditch and mound, then a space of 25 yards, another ditch and mound, a space of 15 yards, again a ditch and mound, a space of 12 yards, and lastly of two mounds with a ditch between them. The eastern terminations of these lines have been disturbed and nearly removed by the formation of a road. About 200 yards north of the last lines the hill-top consists of a narrow neck of land, flanked by very steep hill-sides, and this may also have been fortified; the term Yat or Gate seems to apply to this narrow passage. The position thus defended is remarkable; immediately within the lines the highland terminates in a rocky head some 300 or 400 feet above the river which flows on either side, this point is flanked by almost precipitous rocks rising from the banks of the river; to the north of this headland, at a lower level, is a second headland, bounded by a wall-like escarpment of rock, beyond that is a tract partly alluvial, and but little above the level of the river. The first-named headland forms a splendid look-out over a grand expanse of country; the lower headland, with its nearly level surface, might form a fine camping ground, and the low-lying lands beyond, encircled by the river, may have served as a secure place for herds of cattle. On the hill Great Doward, a mile to the west of Symonds Yat, and on Penyard, four miles to the north-east, are ancient Camps, but both lie beyond the limits of our county.

No. 67.—On the crest of the hill which rises to the east of Littledean is a circular Camp, remarkable for its small size and singular construction. On approaching it, it looks not unlike a large circular tumulus; a ditch six feet deep surrounds a mound 12 feet high, and the area enclosed has a diameter of only 17 yards in one direction and of 22 yards in another. There is an entrance from the south-east. So small a space could have afforded shelter to only a small number of combatants, but the mounds must have been very difficult of assault, the outer sides being very steep, and some 18 or 20 feet high above the ditch. A section of this Camp is given on Plate III, fig. 41.

No. 68.—At Sowdley Green there is a fortified position with an enclosed area not much larger than that of the Littledean Camp, but of a different construction. This Camp at Sowdley is not very well known, it can be reached by walking for two miles directly south along the ridge on which Littledean Camp is placed, and then turning down to Sowdley by a narrow, winding, water-worn way, called "Stoney Ditch." The walk along the ridge is a very fine one commanding views over the Severn and the vale of Berkeley to the distant Cotteswold Hills; the path leads through brakes and glades, and passes beneath some magnificent beech trees, left to tell of the grandeur of the old Forest scenery; then descending from the ridge into the valley at Sowdley there is one of those contrasts of scenery and association so characteristic of the Forest of Dean; the quiet glades, where the cry of the wood-pecker, of the jay, or of other birds which shun the company of man, have been almost the only sounds heard, are suddenly exchanged for all the sights and sounds connected with iron furnaces, mills, cottages, and railways.

The Camp at Sowdley Green is at the termination of a low ridge marked on the Ordnance Map "Scilly Point," its situation is very picturesque, the little river is there dammed up, and forms a shallow pool, from its side rises a steep rock, on which this Camp is perched, a fine old yew tree growing on the edge of the rock and within the ramparts, adds to the effect. The defences of this Camp are irregular, the south side of the rock being so steep that no defence was needed, on the east side only a slight mound two feet high was raised, but on the other sides, where the adjoining ground is nearly level, there is a ditch and mound, forming a strong defence, with a slope of 14 feet from the ditch to the top of the mound. There is a well marked entrance to the enclosed area, which area is only 32 yards in diameter.

No. 69.—At Stow Green, three miles south of Coleford, there is a small circular Camp, locally known as "Castle Tump;" it is at the termination of a projecting spur of Bearse Common, and is but slightly above the shallow valleys which run round it on three sides, (see Plate IV, fig. 44.) It is defended by a strong mound of stones, in one part still eight feet high on the inside and 10 feet high on the outside, where there is a slight ditch. There is an entrance from the level land on the south. The area enclosed is 35 yards in diameter. A portion of this Camp having been quarried away for limestone, and the enclosing mound broken down in places, and with old ash trees, polled and knarled, growing out of its ruined defences, the whole has a drear and desolate aspect.

No. 70.—In Lydney Park, at the termination of a spur of the hills, there is a small circular Camp, enclosing about a quarter of an acre. A very slight defence encloses this Camp, the sides of the hill on which it stands being very steep on three sides, whilst the neck connecting it with the hill on the north is defended by an additional defence, consisting of a mound and ditch, (see Plate IV, fig, 43). Across the valley on another projecting point, (marked 70a), are the well-known remains of a Roman temple, villa, and baths; this position is slightly defended by an earthwork running across it and along its eastern side.

No. 71.—A little south-west of Tidenham Church there is an oblong hill, marked on the Ordnance Map "Combesbury." Attracted by the name, I lately examined this hill, and was rewarded by finding at its south end a small circular Camp, enclosing about one acre. The defence is a very slight bank of stones with a ditch outside running round the enclosed area, but towards the south this is strengthened by large rocks piled up, apparently forming a rude wall, but it is at present so overgrown with thorns as to make an examination of it difficult.

No. 72.—Half a mile west of Combesbury there is a hill called Yewbury. On examination I found that this hill has been fortified, a *slight* mound runs along the edge of the escarpment, but it is now much broken by quarries, and the eastern end has been ploughed down. This hill commands a fine view over Sedbury, and of the ancient Camp "The Bulwarks," west of the Wye.

Half a mile north of Yewbury is a place named Ashbury, where there is on the highest ground an enclosure covered with coppice, which renders the ground difficult of examination, but its position and name seem to point to its having been a Camp. Worked flints are found on the surface of the cultivated fields at Ashbury.

No. 73.—The termination of a level plateau a furlong east of Bigswear Bridge is marked on the Ordnance Map "Ancient Intrenchment;" the position is well suited for defence, the headland having a steep bank round it, but the plateau is under cultivation, and there are no traces of intrenchments left.

Nos. 74 and 75.—On the hills east of Tintern there are extensive "Intrenchments." From Tintern they may be reached by crossing the Wye by the ferry hard by the Abbey, and then winding up the hill sides by paths through woods made beautiful by a profusion of ferns, mosses, and wild flowers. At various points of the ascent glimpses are caught of the windings of the river, and of the valleys which surround the old Abbey, and from the summit very extensive views are obtained of this beautiful district. A spot on this commanding situation is marked on the Ordnance Survey "Modesgate Ancient Camp," but at present this spot is covered by the densest of coppices, quite precluding the possibility of tracing earthworks, if any exist there. From Modesgate for two miles southward there is a remarkable line of Intrenchment, it consists of a mound of stones and earth thrown up on the edge of the escarpment, (see Plate IV, fig. 75, and section Plate III, fig. 39). There is a wide ditch on the east side, and in places there is a slight ditch on the west side on the mound, from which the materials for the mound have been taken. This mound follows the windings of the escarpment; on its west side the hill slopes down very abruptly towards the Wye, whilst in many parts the ground on its eastern side slopes upwards from it. It appears to be a line of demarcation, and not a defensive work, and is generally considered to be a portion of Offa's Dyke.

No. 76. Plate IV, fig. 76.—The peninsula on which the chapelry of Llancaut is situate is strongly defended by earthworks, which have been claimed as part of Offa's Dyke, but they are very different in character from the works just described. Two lines of earthworks run across the neck of the peninsula, the ends of these lines rest on the precipitous rocks, and their construction is shown on section fig. 38, Plate III. At the end of the level area enclosed by these works there is another line running across the hill-top, this consists of a mound 20 feet wide at its base, and six feet high, without a ditch on either side. The neighbourhood of this intrenched position is known as "Caerwood," the area lying between the two lines is called "Spital Mead," and the inner line goes by the name of the "Plague Mound." The first name appears to apply to its use as an ancient Camp, the second to its occupation in later times as an hospital, probably on an occasion of a visitation of the dreaded "Plague" to the neighbouring town of Chepstow, possibly as a "Pest-house" when inoculation of small-pox was practised. There are remains of the foundations of buildings near the "Plague-mound," and it is obvious that this fortified point was well suited for the purpose of isolating cases of contagious disease.

No. 77.—At Sedbury there is a fine earthwork, the position and extent of which is shown on Plate IV, fig. 77. It runs from the edge of Sedbury Cliffs on the Severn for one third of a mile, and consists of a mound about 25 feet wide, and in some places six feet high, with a ditch on the south side; as the ground falls away on the south side, there is in some places a height of 15 feet from the bottom of the ditch to the top of the mound. This work is irregular, and the strength of the work varies in different parts. A modern road passes the western end of this earthwork, and on the west side of the road is a mound known as "Buttington Tump," and a ditch-like road runs from this spot down to the low land adjoining the Wye; the mound and ditch, if strengthened with stockades, would have formed a line of defence reaching from the shores of the Severn to the Wye, and constituting the Beachley promontory a safe enclosure for cattle. Although it is heresy to doubt that this Sedbury Intrenchment is the southern termination of Offa's Dyke, I do not think it was originally formed by command of King Offa, though this and other previously existing works may have been adopted as portions of his extensive line of demarcation. On reference to the section Plate III, fig. 40, it will be seen that the plan of this work differs from the works which run along the edge of the escarpment south of Modesgate, as shown in section fig. 39. The ditch is placed in the Sedbury intrenchment on the lowest side, and in the Modesgate lines on the upper side, the position from which materials to form the mound could most readily be obtained. The Sedbury earthworks appear to be the defence of the comparatively high ground of Sedbury Park from an attack directed from the Beachley promontory.

Buttington Tump is 60 feet long, 27 feet wide at its widest part, and 10 feet high at its highest point; it is oval in form, the broadest and highest portion is at the east end, and it has the appearance of being an oval Tumulus; I am informed that it was opened by G. F. ORMEROD, Esq., and urns and coins taken from it, but it is possible my informant is mistaken on this point. The site of Sedbury Park was occupied by the Romans, the late Dr. ORMEROD discovered there evidences of this occupation, consisting of pottery, such as amphoræ and mortaria of ordinary Roman ware, and also glazed red Samian, with the stamps of the makers. He also discovered in the park a Roman kiln for the manufacture of pottery. Buttington Tump in its outline and dimensions resembles a Roman Tumulus, and not the large oval Tumuli constructed by the earlier occupiers of this county.

No. 78.—At Beachley Green, half a mile south of the Sedbury lines, the ground rises into a slight elevation, RUDDER states that there were earthworks here in his day, and two fields lying on the slope between this higher ground and the Wye are still known as the Upper and Lower Bulwarks.

The earthworks of the Forest of Dean, taken apart from those on the eastern side of the Severn, are very interesting; there are the three promontories of Symond's Yat, Lancaut, and Beachley, cut off by intrenchments, which, beside forming military defences, so protect those three large areas that they may well have served as cattle enclosures. The remaining seven or eight Camps are, on the other hand, remarkable for their very small size. As regards the work ascribed to King Offa, all the efforts of Antiquaries to trace it as a continuous line have left it a fragmentary work, even when such positions as Symond's Yat and Lancaut have been adopted as portions.

The foregoing is probably not a complete list of the ancient Camps of Gloucestershire, there may be some remains of earthworks so slight as to have escaped notice, and others may still be hidden in woods or by hedgerows; the tradition of some has come down to us only in the names of places, as for instance, at the village "Camp," two miles north of Bisley, where there are remains of several Tumuli, but none of embankments, though such may have formerly existed on the point of the hill where Hazle House stands, for it is well suited for a Camp, and has a spring of water immediately below it. In front of Hazle House there are some mounds and terraces, but these are remains of a garden. There is a tradition that there was "in old time a large town" in the valley below the village Camp. The descriptive term *Bury* occurs in the names of many places in Gloucestershire where no earthworks remain, and in some cases there can be little doubt that a Camp formerly existed in such localities, but that all traces have been lost of them, such is probably the case at Tewkes*bury* and at Thorn*bury*. In some instances the term *Bury*, as applied in the names of places, no doubt refers to known Camps at some little distance, as in Prest*bury*, under Cleeve Camp, in Sod*bury*, under the well-known Camp on the hill above the present village of Sodbury, and in Hen*bury*, under Blaize Castle, but in other instances the name appears to have preserved the tradition of camping grounds not defended by earthworks, but possibly stockaded, for instance at Old*bury*-on-the-Hill, is *Bury* Hill, where no earthworks can be traced (unless a slight mound at the west side of Oldbury churchyard be an ancient work), but the hill commands an extensive view to the south and east, and has at its foot a spring of water, "Joyce Pool," most useful in that district. At Hawkes*bury* again there are several headlands capable of easy defence, and in particular "the Knoll," east of the Somerset Monument, which has a natural bank running across it and an artificial hillock at its extremity. El*bury* Hill, half a mile north of Charfield Station, rises boldly from the valley, and commands a view of considerable extent over what was formerly Kingswood Forest, but there are no defensive works on Elbury Hill. West*bury*-on-Trym has in its neighbourhood several headlands capable of defence, but these have long been occupied by dwelling-houses and gardens, in the laying out of which, ancient earthworks may have been destroyed. On the west of the Severn there are two places which, judging from their names and situations, may probably retain traces of Camps, but want of time has prevented me from visiting them,—Stone*bury*, one mile north-west of Lydney, and Cock*bury*, two miles west by south of Clearwell. *Bury* Hill, Christ Church, south of English Bicknor, has no remains distinguishable as ancient earthworks, but the surface of that hill is much broken by pits and quarries. At West*bury*-on-Severn no Camp has been found; is it possible that one existed on Garden Cliff, and that it has been removed by the encroachments of the Severn wearing back the cliff?

The association of the term Bury with so very many of our ancient earthworks, whilst it does not prove their construction by the Saxons, indicates the value set upon them by that people. THOMAS WRIGHT, F.S.A., considers that many of these fortified positions were the sites of the dwellings of Saxon chiefs, but as their halls and houses were constructed of wood, all traces of this special occupation have been lost.

The term *Borough*, as applied to places in Gloucestershire, may in some instances refer to Camps, but in several cases it is evidently synonymous with Barrow, and refers to a neighbouring tumulus, as in Benborough, Longborough, Wadborough, and perhaps in Lasborough. On the Ordnance Map a "Camp" is marked at English Bicknor, but on examination the earthworks so marked are found to consist of a square mound, with projections at the angles, and surrounded with a deep moat-like ditch, and are evidently the site of a mediæval castle. "Castle Tump," two miles north of Newent, was also probably the site of another small castle.

It will be seen from the foregoing descriptions that the most usual form of construction of the Gloucestershire Camps is that in which a projecting portion of a hill-top is cut off from the plateau by earthworks; the instances in which a Camp was formed by a curved line of works, with the ends resting on the escarpment, is only a modification of the former plan; in both, the steep and usually undefended sides of the escarpment formed a large portion of the boundary of the Camp. This characteristic was probably valued, for whilst an attack was scarcely possible, or would be made at great disadvantage up the steep hill-sides, they afforded a ready means of escape to the occupiers of the Camp if overpowered by an attack from the plateau.

In savage warfare treachery is usually combined with boldness in attack, whilst a prudent regard for personal safety is conspicuous in defence, and many illustrations of these principles have occurred in late years in the wars of civilized nations with savages, as in New Zealand, in Africa, and in North America. In our war with natives of New Zealand, thirty years ago, an attack was made on the Gate Pah, when, after three or four days fighting and the loss of many valuable officers and men, an entrance was effected, only two or three wounded Maoris were found left in the Pah; although it had been supposed to have been completely surrounded by our forces, the Maoris had escaped across a morass which had been regarded as impassable. The greater number of our ancient Camps of Gloucestershire were admirably adapted for running away from, and for illustrating the prudential maxim—

> "He that fights and runs away,
> May live to fight another day;"

so the defenders of *our ancient Camps* could, when overpowered, easily steal away along the wooded sides of the hills, and reassemble at one or another of the neighbouring hill fortresses. This applies especially to the Camps on the escarpments of the Cotteswolds, but even the fortified isolated hills, as Little Salisbury, Uley Bury, and Meon would require a very large force to invest them so that their defenders would be unable to make an escape.

Of rectangular Camps there are few examples in Gloucestershire; Sodbury is the most perfect, Bourton-on-the Water has one angle remaining, the rectangular Camp on Lansdown is a very slight work.

The oval or nearly circular Camps at Windrush, Chastleton, and Charlton Abbots have this peculiarity, that no advantages of position have been sought by their constructors, they are placed on level land; the small circular Camps at Stow Green, Lydney, Combesbury, and Michaelwood are of a different type, they are situated at the termination of hill-tops.

Some Camps have been claimed as Roman because they are in the vicinity of roads supposed to have been constructed by that people, but on reference to the Map (Plate I,) it will be seen to be difficult to construct a road on a straight line of any considerable length without coming near ancient Camps. The Rev. H. M. Scarth has pointed out that several of the ancient Camps of Somersetshire are in the vicinity of Wansdyke, implying their connection with that very ancient line of demarcation, but in fact in every hilly district these strongholds and hill-forts abound, so that little can be proved by the proximity of certain Camps to either roads or dykes.

It is very difficult to assign to simple earthworks the period of their construction, a thorough and careful examination of their materials may bring to light some relics, such as flint implements, pottery or coins, but these do not prove the age of the earthworks, for such objects may have been scattered on the soil prior to its having been used in the formation of the mounds. Neither do the objects found in the area of these Camps prove who were their constructors, though they may point to their *occupation* by certain peoples. There can be little doubt that these ancient works are referable to various ages, some possibly to pre-historic times, whilst others are probably Saxon or Danish, or even later.

The finding of a few Roman coins within a Camp, or even in its vicinity has in the case of many of our Gloucestershire strongholds been held as proof that the Camp was Roman, but Roman coins are found throughout the county, in the soil of fields, in gardens, in woods, remote from Camps. Some writers have strangely mistaken the forms of various Camps, and described them as regular in outline, when there is not a straight line or right angle in them. Fosbrooke gives a drawing of the Camp on Bredon hill, and figures it as a polygonal structure. Mr. Baker describes Horton Castle as having an irregular four-sided figure. The greater number of writers on this subject have treated them as Roman, the idea that a chain *of Camps* was constructed here by Ostorius, founded on an assertion of a Latin writer that it was the intention of Ostorius so to do, runs through the arguments of Antiquaries, and the attempt to connect our Camps with the stations of Antonine's Itinerary, has been made the groundwork of many a theory. Even

Camden was exercised on the subject of the Abone and the Trajectus, and Dr. Ormerod states that no less than twenty theories have been propounded on this subject by Antiquarian authors of the last two centuries. Some of our earthworks have been claimed as the scenes of events recorded in the "Saxon Chronicles," and with great ingenuity proved (to the satisfaction of the writers) to be the sites mentioned in the accounts of particular battles, when the same historical events have been proved, with equal show of probability, to be referable to other localities.

It is reasonable to suppose that the sites of many of our Camps, and especially of those on naturally strong positions, have been occupied as defended posts by successive races, ever since man inhabited this portion of the globe. The first family who set foot on our hills would, on the approach of the first sunset, seek some place of security in which to pass the night. With, it might be, dreaded foes pressing on their rear, with beasts of prey around, and unknown dangers before, they would choose some site easily defended, and from which a wide extent of country could be viewed, conditions which present themselves on many a projecting headland of our hills. Although there have not as yet, I believe, been met with any implements of Paleolithic type, there are abundant indications *in the worked flints found in the surface soil, and in numerous burial mounds, of the occupation of our county by men using implements of Neolithic type.* Oval tumuli occur on the Cotteswold range, circular tumuli throughout the county, the former the burial places of a race apparently unacquainted with the use of metals, the latter of a race having implements and ornaments of bronze.*

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* A late writer—Ferguson—on "Rude Stone Monuments," says: "If burying in barrows had been the fashion in Gloucestershire as it was on the wolds of Yorkshire or the downs of Wiltshire . . . . but there are hardly half-a-dozen tumuli in the whole county; they, like Uley, Rodmarton, Stoney Littleton, are all chambered tumuli of one class and apparently one age; all, too, it may be remarked, are close to Roman stations and surrounded by evidences of Roman occupation." There is no need to refute this hasty assertion, but the abundant evidence of the sojourn of a Flint-folk here is worth noting. Dr. Thurnam in his paper on Ancient British Barrows, gives a list of thirteen *Long Barrows* in Gloucestershire, and there are at least ten more which may be ascribed to that type. The number of circular tumuli cannot now be ascertained, for besides the large number of which traces remain very many referred to by Rudder 100

It is possible, but scarcely probable, that this occupation of the two races was contemporaneous. The supposed connection of the Flint-folk with the Camp on Birdlip Hill (No. 15) and that south of Nailsworth (No. 38) has been pointed out, and there are not wanting evidences that the sites of other Camps were first occupied by the Flint-folk; a careful search beneath the turf of the fortified headlands will probably confirm this, for I am informed that in the section of the escarpment at the point of Crickley Hill worked flints are met with under the turf.

The warlike habits of the various tribes inhabiting Britain prior to its invasion by the Romans, doubtless led to the formation of some of our hill fortresses, and to that period may be referred the groups of pit-dwellings on Minchinhampton Common, on Rodborough Hill, on Selsley Hill, and on Westridge, in each case accompanied by earthworks, which would serve as

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years ago have entirely disappeared. As regards the evidence of this occupation as afforded by surface flints, I have carefully noted all finds for the last six years with the following result, that whilst there is scarcely a cultivated field in Gloucestershire on which a worked flint may not be met with, this distribution as regards number is very unequal. On the high and waterless tracts from Lansdown to Tetbury, and again on the still higher and equally waterless hills from Leckhampton to Nottingham Hill they are found in very small numbers; but at lower elevations with supplies of water they are found in considerable numbers, but still very unequally, for frequently *a small area* will yield a large number of implements and chips, when for a great distance around the chips occur sparsely, and the implements are rare. The following table embodies some of the results of my collectings from various localities.

	Arrow Heads	Javelin Points	Scrapers	Flakes (broken)	Cores & Hurl-stones	Chips
On high ground 700 feet above the sea......	1	1	7	9	1	244
From a lower elevation	16	24	107	209	55	6253
Near Gatcombe Tumulus and Longstone	40	32	160	350	83	3217
Near Cherrington	8	12	50	125	34	3628
Near Hazlewood Copse Camp..................	11	12	60	180	32	2440

The first two finds are from very extended ranges, the last three from small areas, each adjacent to springs of water. A small number, especially of those found on high ground, show no sign of human workmanship, and are simply flint gravel, and may owe their position on our hills to geologic agencies. The distribution of worked flints does not *prove a lengthened* occupation of the Cotteswolds by Flint-folk, even two or three generations of men using stone implements might leave all those enumerated above, and their very general distribution may be accounted for by the restless, wandering habits of savages, largely dependent on the chase for food supplies. On the eastern slope of the Cotteswolds, near Stow-on-the-Wold, in a locality abounding in tumuli, the Rev. D. Royce has collected, chiefly from Swell Wold, a very large number of worked flints, including 600 arrow heads. The tumuli of the Cotteswolds indicate either a lengthened occupation by a sparse population, or a shorter sojourn by a numerous people.

refuges. Probably other Camps of our county had pit-dwellings in their vicinity, the traces of which have been lost by cultivation of the soil on which they stood. That these *pit-dwellings* were constructed and occupied by a later race than the Flint-folk is clearly proved by the fact that only one flint implement, *and very few* flint chips, have been met with in the careful examination which has been made of a large number of the pit-dwellings of Minchinhampton Common, Rodborough Hill, and Selsley Hill, and also by the fact that on the surface of Westridge, covered as it is with pit-dwellings, scarcely any flints are found. The flint flakes seen on the section at the top of the quarry on Long Cam Down were probably left on the surface of that hill before the pit-dwellings were made there.

It is difficult to realize sufficiently *the thoroughness* of the Roman occupation of Gloucestershire, both in a military sense, and as settlers. Their fortified towns and military roads, and such Camps as Sodbury, Bourton-on-the-Water, and their evident occupation of other Camps, such as Uley Bury and Clifton, attest the former, and their numerous villas and their extensive iron-works in the Forest of Dean confirm the latter. At various times during their long occupancy, when their authority was challenged or their possession disputed, *many* of the Camps of the county were no doubt occupied by them.

During the anarchy which prevailed after the departure of the Romans, and during the almost constantly disturbed state of the land for the succeeding six hundred years, in which Briton and Saxon and Dane struggled for the possession of the country, of what value must these strongholds have been, as places of security for residences, or as military posts.

By speaking of any of our Camps as British, or as Roman, or as Danish, their subsequent use is much lost sight of. Earthworks such as these, once constructed, are ever ready for use, and we may believe that such has been the case with the ancient Camps of Gloucestershire; even in comparatively recent times some have been occupied as military positions, as in the Civil War Sedbury was by Prince Rupert, and Painswick Camp by King Charles and his army, after his unsuccessful attack on the city of Gloucester.

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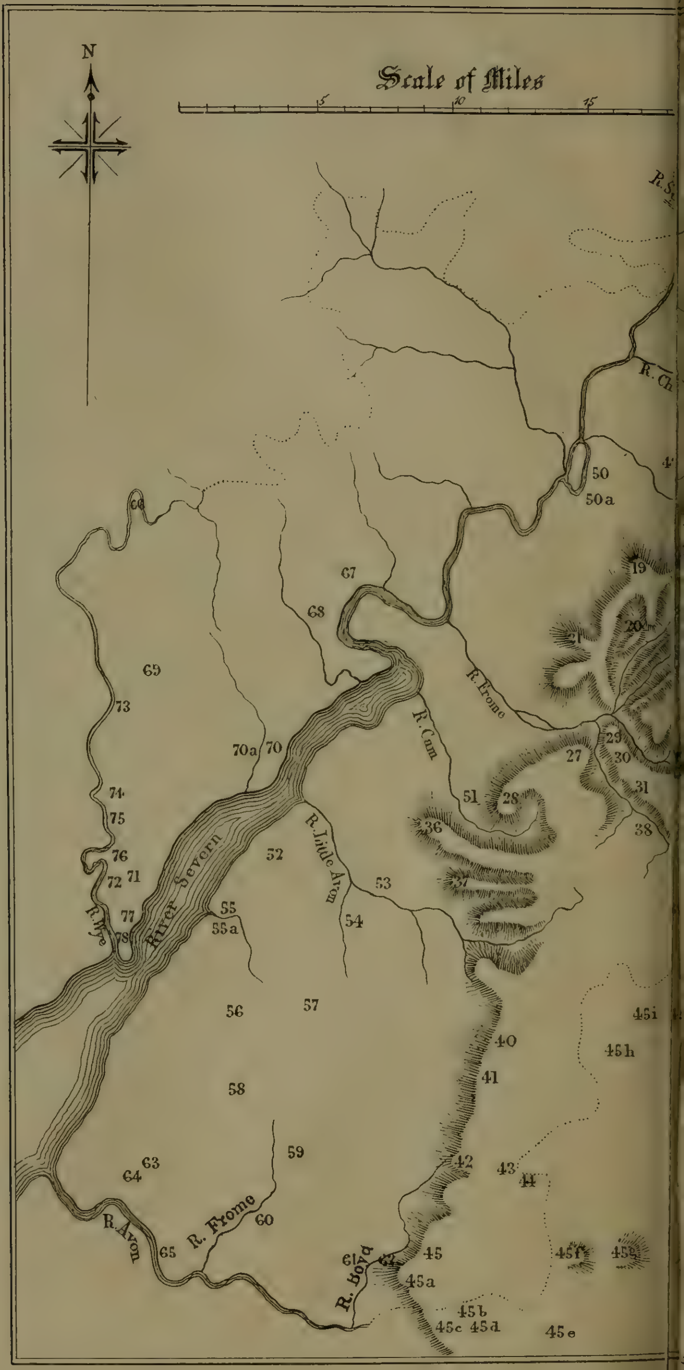
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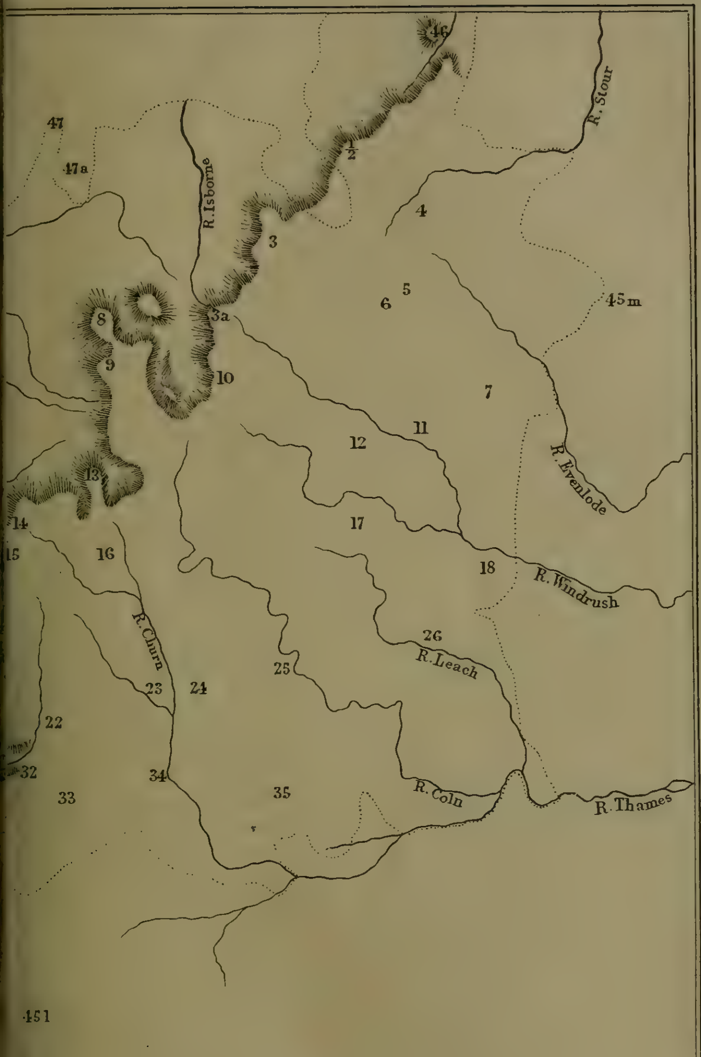

SKETCH MAP
OF
GLOUCESTERSHIRE,
SHEWING AT "1" TO "78" THE POSITION OF
ANCIENT EARTHWORKS.

NATURAL HISTORY.

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Plate. II.

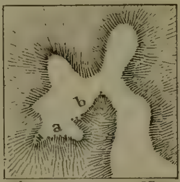


Fig. 1. Nº 36.

STINCHCOMBE

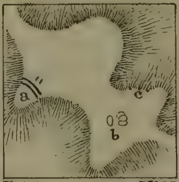


Fig. 2. Nº 37.

WESTRIDGE

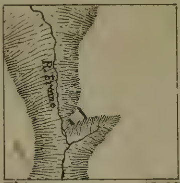


Fig. 3. Nº 22

PIMBURY

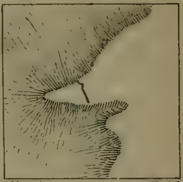


Fig. 4. Nº 14

CRICKLEY HILL

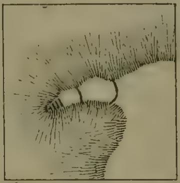


Fig. 5. Nº 21.

HARESFIELD

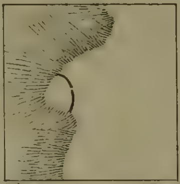


Fig. 6. Nº 40

HORTON

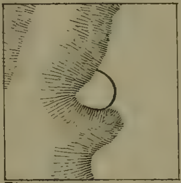


Fig. 7. Nº 42.

DYRHAM

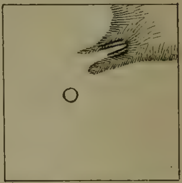


Fig. 8. Nºs 5 & 6.

EUBURY & CONDICOTE

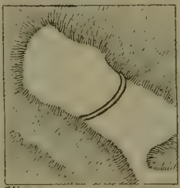


Fig. 9. Nº 8.

NOTTINGHAM

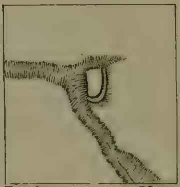


Fig. 10. Nº 33.

TREWSBURY

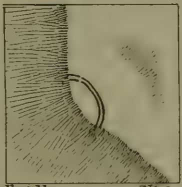


Fig. 11. Nº 9

CLEEVE

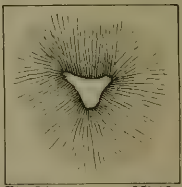


Fig. 12. Nº 45e

LITTLE SALISBURY

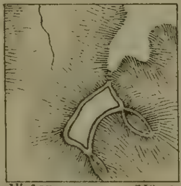


Fig. 13. Nº 28.

ULEY BURY

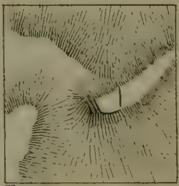


Fig. 14. Nº 20.

PAINSWICK

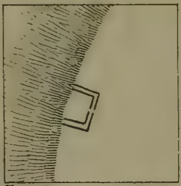


Fig. 15. Nº 41.

SODBURY

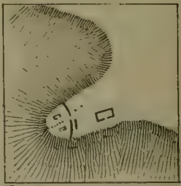


Fig. 16. Nºs 45c 45d

LANSDOWN

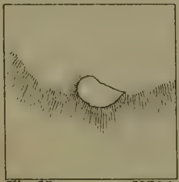


Fig. 17. Nº 35.

RANBURY

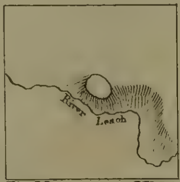


Fig. 18. Nº 26.

LADBOROUGH

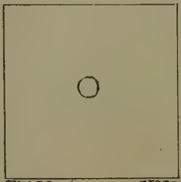


Fig. 19. Nº 18.

WINDRUSH

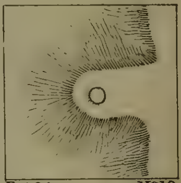


Fig. 20. Nº 10.

CHARLTON ABBOTS

CAMPS ON THE COTTESWOLD HILLS.

Scale 1 inch = 1 mile

Plate. III.

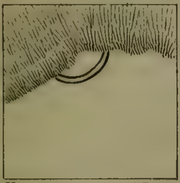


Fig. 21. N° 47.
BREDON

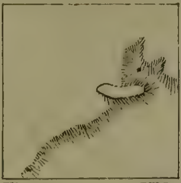


Fig. 22. N° 57
TYTHERINGTON

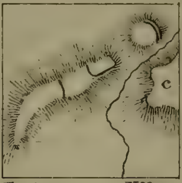


Fig. 23. N°s 63 64
KINGS WESTON & BLAIZE

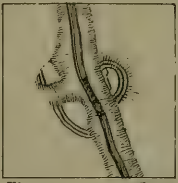


Fig. 24 N° 65.
CLIFTON

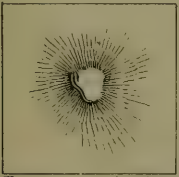


Fig. 25. N° 46.
MEON HILL

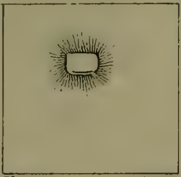


Fig. 26. N° 48
TOWBURY

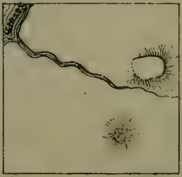


Fig. 27. N° 55
OLDBURY ON SEVERN

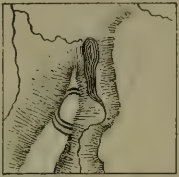


Fig. 28. N° 54
TORTWORTH PARK

Scale 1 inch = 1 mile

CAMPS BETWEEN THE COTTESWOLD HILLS & THE SEVERN.

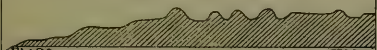


Fig. 29. DRAKESTONE. STINCHCOMBE N° 36

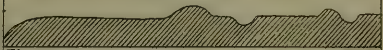


Fig. 30. BLACKENBURY DITCHES WESTRIDGE N° 37

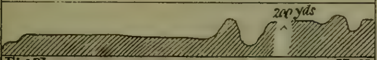


Fig. 31. HARESFIELD BEACON & CAMP. N° 21

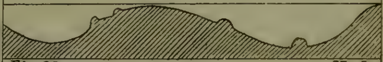


Fig. 32. EUBURY N° 5.

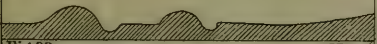


Fig. 33. CLEEVE CAMP. N° 9.

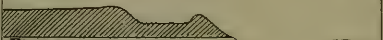


Fig. 34 ULEY BURY N° 28

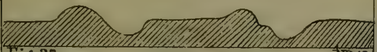


Fig. 35. SODBURY N° 41

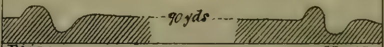


Fig. 36 BREDON CAMP N° 47.

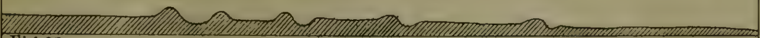


Fig. 37. SYMMONDS YAT N° 66

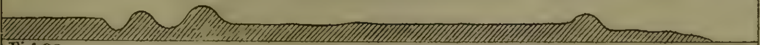


Fig. 38. LANCAUT N° 76

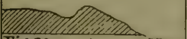


Fig. 39 OFFA'S DYKE N° 75

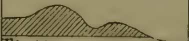


Fig. 40. SEDBURY N° 77

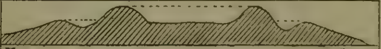


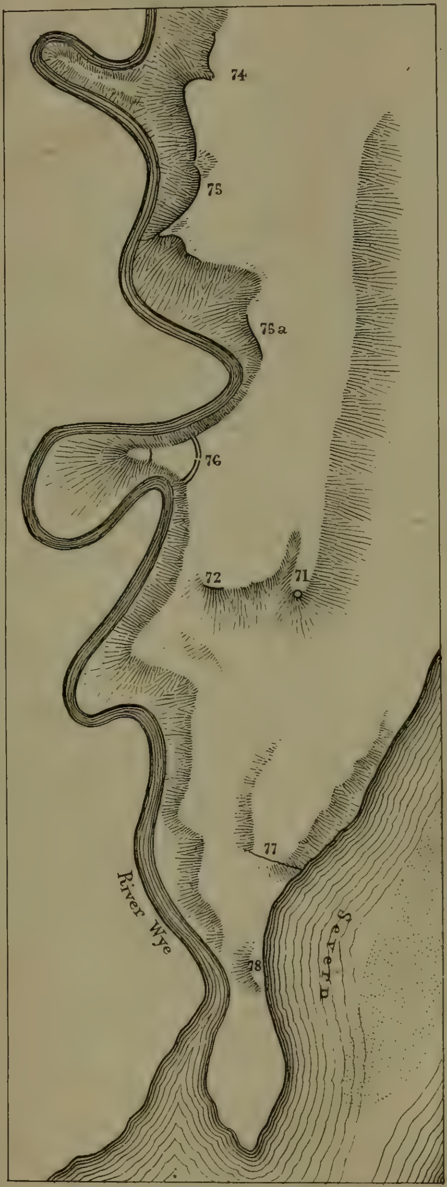
Fig. 41 CAMP NEAR FLAXLEY N° 67.

SECTIONS OF EARTHWORKS. Scale

BRITISH MUSEUM
NATURAL HISTORY

BRITISH MUSEUM

Plate. IV.



74.75. MODESCATE & DYKE 71. COMBESBURY
76. CAERWOOD 77. SOEBURY
72. YEWBURY 78. BEACHLEY GREEN

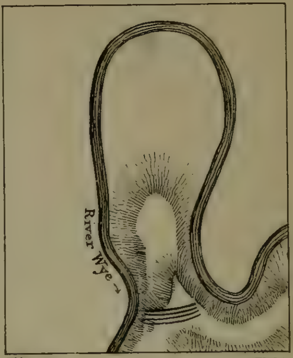


Fig. 42. Nº66.

SYMMONDS YAT.

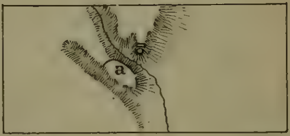


Fig. 43. Nº70.

LYDNEY PARK

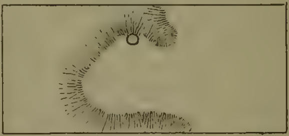


Fig. 44. Nº69.

STOW GREEN

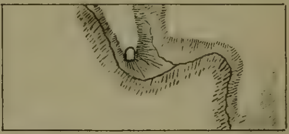


Fig. 45. Nº68.

SOUDLEY

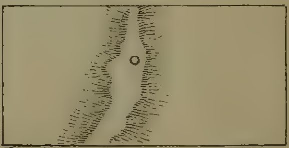


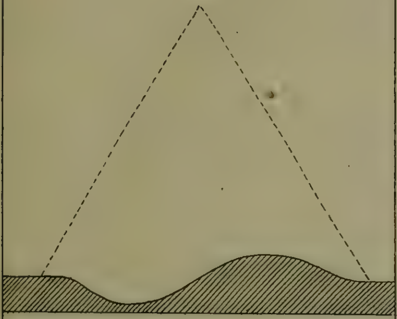
Fig. 46. Nº67.

LITTLE DEAN

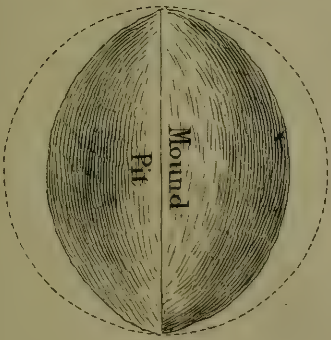
EARTHWORKS BETWEEN THE SEVERN & THE WYE.

Scale 1 inch = 1 mile

Plate. V.

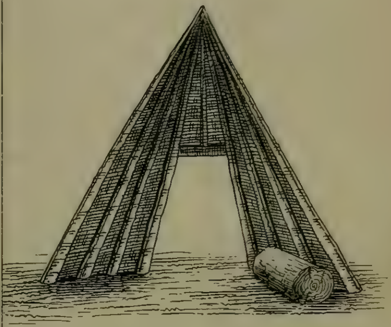


Section of Pitdwelling.

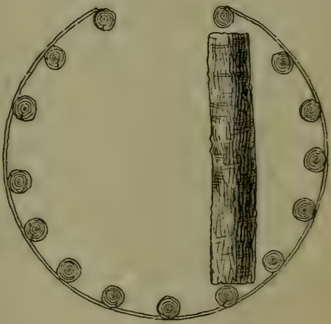


PLAN

Ancient Pitdwelling
on Westridge.



Section of Woodman's Hut.



PLAN

Woodman's Hut
on Westridge 1874.

BRITISH MUSEUM NATURAL HISTORY

The Geology and Archæology of Malvern. By the REV. W. S. SYMONDS. *Read at the Meeting at Pendock, July* 20, 1875.

The strata which are known to Geologists as the Mesozoic succeeded the concluding stage of the old worlds of life known as the Permian. The Triassic and Permian geologic histories are somewhat desolate in their records of animal and vegetable life. The Permian rocks are the twilight of the long old-life periods; the Triassic are the dawn of that secondary or middle life epoch, when the old life forms and races pass away for ever, and are replaced by new forms, dynasties, and races endowed by their Creator with fresh modes of action, energy and life. Within a short walk we may pass from the newer rocks to the older, from the Trias to the Permian, and from the Permian to a locality where we may step, in a few yards, from the youngest of the old-life rocks (the Permian), on to the representative of the most ancient stratified rock masses we are acquainted with in the crust of this planet, the Laurentian gneiss of the Malvern Hills. The walk from the Trias of Redmarley to the Permians of Haffield Camp is easy, and from the Permians which fringe Howler's Heath to the Laurentian gneiss of the Chase End Hill of the Malvern range is easier still; but in the history of successive life periods what a vast gulf lies between! We may liken it to a Geologist who has laid himself down to rest with his mind floating among the forms of the old world animals he has been studying, when the spirit of death comes across him, and he awakes in a new world, covered with new plants, and inhabited by new animals. From the ridge near Hazeldine, in the parish of Redmarley, we look upon the representatives of a great and complex system of formations. In the Cotteswold and Bredon hills we behold old sea-beds piled one above another, and filled with the remains of animals which lived in the Jurassic seas, and indeed every quarry among these ancient deposits affords relics of the characteristic animals of the Oolitic and Liassic periods. The ridges of Corsewood Hill and Hasfield wood, to the south-east, are capped with the lowest strata of the Liassic rocks, and below them lie the Rhœtic beds of the Geologist, which, as you are aware, constitute the summit of the New Red Sandstone or Triassic series. The wooded hill of Berrow, just in front, is an outlier of upper Keuper Marls, capped by the lowest Lias and Rhœtic beds, and an important outlier it is, for it testifies of the prolongation of these beds of the Liassic and Rhœtic seas to within two miles of the Malvern range, where they no doubt once formed a shore boundary to the Rhœtic and Liassic waters. The triple division of the upper Keuper rocks is well marked out in the country east of Redmarley. The uppermost Keuper Marls rest immediately below the Rhœtic fossiliferous strata and the bone bed, and form the principal part of those low hills you see rising above the flat plain east of Redmarley, such as Sarnhill, Corsewood Hill, Hasfield Woods, and Berrow Hill. Below these upper Keuper Marls you may see the upper Keuper Sandstone of Eldersfield, Staunton and Pendock forming low escarpments and ridges above the lower Keuper Marls, which are for the most part cut out into narrow vales with the upper Keuper Sandstone on their crests. These lower Marls are the equivalents of the salt-bearing beds of Cheshire and Droitwich, and below them again are the lower Keuper Sandstones of the Geological Surveyors, and which constitute the rock on which is built the Church of Redmarley, and the residence of Lady Roberts—Hazeldine. These lower Keuper rocks, with the Bromesberrow Bunter beds, form the Ryeland district of Redmarley D'Abitot, Bromesberrow, Pauntley, Oxenhall, Newent and Taynton. Near Newent they overlap the faulted coal measure rocks, which stand as it were on edge between them and the Old Red Sandstone of Hill House Grove, and Dymock country; the lower Keupers and Bunter beds having been deposited uncomformably over the upturned edges of the coal rocks. The history of the escarpment on which stands Hazeldine is that we are here on a *line of fault,* which runs at right angles to the range of the Malverns; and you may be assured also that the uplifted axis of the Malverns runs on its line to May Hill, a very short distance to our westward, under a covering of Triassic and Permian rocks, and close to the locality of the Castle Tump, which we visited last year on our Newent expedition. The particular fault we are now on is what is called a cross fault, which runs from south-west of the Chase End Hill, by the Glynch brook, below Hazeldine, and below Redmarley Church. It then faces the south, and crosses by Pauntley and Colin Park, where the lower Keuper Marls are elevated, as well as the lower Keuper Sandstones. When examining the district eastward, it is always well to remember that the place of the waterstones *in situ,* and when not faulted, is below the lower Keuper Marls in the plain, east of the faulted escarpments. Indeed they have been met with *in situ,* and their proper geological position, in the plain opposite to Hazeldine; for some years ago at a cottage a little east of Bury Court, near Redmarley Park, they passed, in sinking a well, through layers of lower Keuper Marls, and quarried the peculiar honeycombed, cornstone-looking beds which are the upper members of the lower Keuper rocks of the district. There are some pebble-beds towards the base of the waterstones, which may be seen at a small farm called The Berrow Farm, in the parish of Dymock. They occupy the crest of a low escarpment, and contain pebbles of a quartz rock, exactly similar to those of the famous Budleigh Salterton pebble-beds in Devonshire. Professor PRESTWICH visited these beds with me, and we believe that these Dymock quartz pebbles were derived from the same source as were those which constistute the conglomerate far away in Devonshire. A search among these quartz-pebbles of Dymock by Captain ROBERTS of Hazeldine, shows them to be fossiliferous, and I wish some one would examine them more closely. Redmarley has also some claim to archæological interest. Its mill is recorded in Saxon times, and its woods are spoken of in the days of EDWARD THE

CONFESSOR. It was surnamed D'Abitot from ROBERT D'ABITOT, steward of the household of WILLIAM THE CONQUEROR, and the church shows still some relics of Norman masonry. Redmarley Park was granted for a term of years to RICHARD BARTHELET, physician to HENRY VIII. Here too lived and died GEORGE SHIPSIDE, who married ALICE, sister to Bishop RIDLEY, who, in his farewell before his martyrdom, wrote to him, and said, "Farewell, my dear brother GEORGE SHIPSIDE, whom I have ever found faithful, trusting and loving in all states and conditions." He bids farewell, too, to his ALICE, who, like GEORGE, was ever faithful, loving and true. "My dear sister ALICE," were the last words penned by RIDLEY before he faced the stake at Oxford. One wonders what were the feelings of GEORGE and ALICE when they heard of the last tortures the Vice-Chancellor of the University and the other commissioners inflicted on him and LATIMER, and which they witnessed, as is recorded, "with pious and complacent countenances." There is at Bury Court, now a small farm house, near Redmarley Park (also a farm house), an ancient building of early English date, but which is used as a cider house. I wish some one of archæological authority would visit this record of Malvern forest days, and tell us more about it, but I can make no more of its history than that it is supposed to have belonged to the SHIPSIDES. Perhaps within its walls ALICE SHIPSIDE bent the knee and asked forgiveness for those who brought such sorrow over the green fields of Redmarley and the woods of Hazeldine. The relations of the "waterstones" of the Redmarley district to the Bromesberrow sandstones or upper Bunter beds, are best seen by walking from Hazeldine to Bromesberrow Gorse, and Russell's End. The waterstones or upper Keuper sandstones overlie some dark red beds known to us locally as the Bromesberrow sandstones. These are the equivalents of similar rocks which rest on the base of the upper Keupers at Grinshill, near Shrewsbury, and occupy the position of the upper Bunter deposits. We have no opportunity of examining any junction of these strata in this country, but I do not think they are conformable to each other. They may be easily distinguished by their colour, and in fallow time between Hazeldine and Russell's End the deep red brick colour of the sloping grounds of the Bunter rocks may be seen dipping under the waterstones of Redmarley. Bromesberrow is said to have been so called from its numerous rounded hills or barrows, and the bright blossoms of the broom (*Cytisus scoparius*) with which its rounded hills were once covered. It is a pleasant hamlet beneath the south slope of the Chase End Hill, one of the south Malverns, and has a church worthy of the worship of God, restored in excellent good taste by my friend the Rev. REGINALD PINDAR HILL. Bromesberrow offers many temptations to the naturalist to linger on summer days in the shade of its lovely lanes and ingle nooks. Like the neighbourhood of the Bunter beds near Bewdley, it is a favourite haunt of the great stag beetle, and the botanist gathers the nodding Star of Bethlehem (*Ornithogalum nutans*) in a field below Coneygre Wood. In another field below Howler's Heath, and close to a hill of Permian breccia, grows *narcissus poeticus* (the sweet-scented daffodil), while on a wall close to the Brownsend, the home of one of the last descendants of the NANFANS of Birtsmorton, grows *turritis glabra* (the tower mustard). Nor is Bromesberrow wanting in other points of interest to the naturalist. At Coneygre Hill grows an ancient yew tree, which last Easter time called forth the admiration of Dr. HOOKER, of Kew, who told me that he hardly knew so fine a tree, or one which, from its growth, shows better proof of its hoar antiquity. On the Glynch Brook, beyond the church, are the remains of an old manor house, belonging to a gentleman named STONE, who resides in Ireland. It is somewhat remarkable that this house has been the property of the STONE family ever since the days of EDWARD II, and that a will is still extant by which Mistress DOROTHY STONE bequeathed her "one pot and one pann to her daughter, the sum of fourpence to the Cathedral Church of Hereford, and a kerchief to the blessed Virgin of Bromesberrow." At the Rectory are some Parliamentary Banners, on one of which is inscribed "Leges Anglicæ Libertates Parliamentorum." They formerly were hung in the church, and were, I believe, carried by YATES of Arlington, at the battle of Worcester.

Two brothers, during the sad history of the Civil Wars, took different sides, and the YATES of Hook House (now Bromesberrow Place), lived to befriend the ruined Royalist. Haffield Camp is celebrated for its fine section of Permian breccia, which presents itself to the southward, opposite to the hall door of Haffield House. Here we see the stratified masses of angular Conglomerate dipping away from an elevated axis of Old Red Sandstone, under the Bunter beds (Bromesberrow Sandstones) to the south. The Bunter beds are exposed at the base of the hill, between the Dick House and Little London. They dipped away at a low angle from Haffield Camp and its Permian breccia. I visited this section in company with my friend Mr. LUCY, of Brookthorpe, when Dr. HENRY had the gravel quarried for road purposes, and I have already alluded to it in my work on "The Records of the Rocks." In the hollow was a mass, first of quartzoze sand, then of boulder clay, and below this was northern drift gravel, containing rolled lias graphites and chalk flints, and in this northern drift was a large Silurian boulder of Wenlock sandstone, resting on an eroded bed of Bromesberrow sandstone. The sandstone beds were grooved and scored deeply across their line of dip, as if by ice, or stones held in ice, dragging across the surface. Many other angular fragments of local rocks were deposited with the Wenlock boulder, which was scratched and polished on one side. I took Professor PRESTWICH, of Oxford, to see this remarkable section, but alas, it was filled up, as being dangerous to cattle. From Haffield we went to the section of drift at Clincher's Mill, on seeing which Professor PRESTWICH at once remarked that the drift there was of two distinct ages. At the base we have a drift of rolled pebbles, and great angular blocks embedded therein. This was, no doubt, the result of the action of water running in a stream down the line of the present Glynch Brook, and this stream must have been traversed also by floating ice, which grounded and stranded the floating erratic blocks of local rocks which were borne down from the north. Over these drifts there is also an accumulation of atmospheric *debris* of considerable thickness, derived from the Wenlock Hill above. This corresponds with the local *débris*, which has accumulated to a great thickness all along the flanks of the Malvern Hills, and in some places extends two miles beyond the hills, and which also, I have no doubt, was accumulated under much colder adaptations of climate than at present; and when great masses of ice and snow, swept down, in the winter time, from the Malvern slopes, and probably melted away beneath the summer sun. These local angular drifts are, I believe, the relics of that last cold period which set in, in these latitudes, during that comparatively late geological period which restored, for a time, the smaller glaciers of Snowdon and the north of Scotland; and which has caused us Geologists no small puzzle, by mingling together drifts and boulders of separate ages through its torrents, produced by melting snows and the dragging action of land ice. Haffield Camp is one of several earth-works which, in older times, were numerous at the south-western end of the Malvern Chain, and appear to have run from Gadbury Camp and Eldersfield, by the Coneygre Hill of Bromesberrow and Haffield Camp, to the large fortress of Wall Hills, near Ledbury. It is interesting to trace the Permian breccia from Haffield, in the direction of the Malverns, and to see how everywhere it dips from the old coast line, against which it was deposited, and by the elevation of which it was upheaved after it had been laid down. It is impossible also not to conclude that the Permian rocks must have once existed *in situ* along the Malvern range, otherwise than a breccia. Nine-tenths of the angular fragments in the Haffield breccia are fragments of Warshill rock (Permian) re-aggregated and re-arranged. It rests against Old Red Sandstone at Haffield, Woolhope Limestone near Clincher's Mill, Llandovery Rock below Howler's Heath, and against the old gneiss of the Malverns north of Bromesberrow Place and the end of the Chase End Hill. The two hills at the extremity of the Malvern range are known as the Chase End and Ragged Stone Hills. The Chase End takes its name from being the last hill in the ancient Chase of Malvern, and its name has become corrupted through mis-pronunciation into Kaison, Keysend, Chaisun. It is the last hill which shows the old Laurentian gneiss in its quarries. Malvern Chase is said to have extended over 6,000 acres in Worcestershire, 600 in Herefordshire, and 100 in Gloucestershire, so it did not extend beyond Bromesberrow. The Chase of Gloucester came on at Murrell's End, in the Parish of Redmarley. Malvern Chase is alluded to by LELAND and CAMDEN. In Saxon times it is said to have belonged to one BRIHTRIC. Later on, WILLIAM of Malmesbury calls it a wilderness, and it was in this wilderness that our Norman forefathers built their early churches, and reclaimed around those churches a few acres of land. EDWARD I gave the whole chase to GILBERT DE CLARE, the Red Earl of Gloucester, and the trench which he is said to have begun digging (A.D. 1287,) with his own right hand, to show the boundary of the right of chase of the Bishops of Hereford from the chase of Malvern, may be still traced along the range of the Malverns, and now divides the county of Hereford from Gloucester on the Chase End; and further on the county of Hereford from Worcester. Malvern Chase passed from the DE CLARES to the DESPENSERS, and through ISABEL, daughter of the King-maker WARWICK, to GEORGE Duke of Clarence. It was disforested in the time of CHARLES the Second. Directly in front of the Chase End rises the weird hill of the Ragged Stone, which is now celebrated for its geological history in ages long passed away, as well as for its legends of gloom attached under its shadow. I alluded to this twofold history in my address last year, on the Newent Coal field and the surrounding district. There are some here now who were not present then, and they may be interested to know that the Ragged-stone rocks are the roots of an ancient Volcano, which in long ago geological ages poured forth its lavas into Lower Silurian seas; and these lavas flowed over sea bottoms, containing the remains of trilobites and other animals which once lived in the waters. That it once reared its crater above the waters is evident from the fact that some of the beds consist of volcanic ash, which must have been evolved into the air and not into the sea. With regard to the legends they are weird indeed, but they have been described by more fairy fingers than mine in the brochure termed "Moreton Court," by a lady, who heard them told when climbing the sides of the Ragged Stone, and gathering the violet and primrose which blossomed in the crevices of its lava dykes. Again these legends have been lately alluded to by Mr. McKay, of the Malvern *Advertiser*, in his "British Camp on the Herefordshire Beacon," which deals with the Druidical Oaks, the "High Court of the Druids," "the Mistletoe and the Bards," "Dyn Mawr, the great city of the Holly Bush," and "the Fires of Peace on Midsummer Hill," in language of legendary rather than historic lore. It is pleasant reading however, and may aid in rescuing some of the traditions and legends of the Malverns from sinking altogether into oblivion. We have heard of the rolling snow ball, which gathers as it goes, and certainly I find that, as I grow older, the Shadow of the Ragged Stone grows longer, and it falls upon places I never heard of, and over races of men who had long passed away before the curse which produced the shadow had been uttered from its brow. It is only for a short time in the year that, from the vale below, the sun lingers behind the Ragged Stone, and its shadow is projected over the vale. For years the fall of the shadow has been a terror to the peasantry, who would not venture to cross its path. It rests awhile, like a dark cloud in the evening sunshine, across fields where the "Danewort" tells of the massacre of the Danes by ATHELSTAN, and the bloody reprisals which followed when SWEYN came up the Severn, burnt Deerhurst Church, and forced its Prior to fly through the forest of Malvern, when he founded at Malvern the Chapel of St. ANN. It sometimes casts a shadow over Moreton Court, the home for centuries of the NANFANS, and reminds us in its legends how WOLSEY remembered, on his death-bed, a prophecy he heard by its old moat, in his youth, a warning of the shadow which ever falls on those who put their trust in princes, or in woman, rather than in God. The shadow has been seen creeping across the field of death, or the "Bloody meadow," just below the hill itself, where GILES NANFAN ran his friend and his sister's lover through the heart, in the days when the "Merry Monarch" ruled in England, an old old tale of love and sorrow, sudden death, and a broken heart. It is said, too, that the Dark Maiden of the Marsh used to creep out from her room at Eastington on a June evening, and watch for the cloud which fell from the Ragged Stone across the plain, and would even sit in its shadow and pray for the time when her "spirit might be joined to his who her own father hounded as a criminal to the gallows," and whose memory she cherished through a life of solitude to the bitter end. Such, gentlemen, are a few of the most striking points in geological, historic, and legendary lore, which belong to the districts round the southern Malverns; but I need not tell you that there is much more of interest for the student of nature, and of history than can be even alluded to in a brief *resumé* of this kind, and that I have merely alluded to certain subjects, such as the history of our Malvern drifts, which are of the highest interest to Geologists, and which would occupy too much time to deal with now. I commend their investigation to the younger Geologists of the Cotteswold Club. Much concerning them has yet to be unravelled, so intricate are the phenomena with which the drift history is shrouded.

Brief Notes on Offa's Dyke. *By* JOHN BELLOWS.

A Welsh writer states that the first invasion of Wales by the Saxons took place in 728, under ETHELBERT, king of Mercia, who fought a bloody battle at Carno near Crickhowell, in which he was victorious over TEITHWALCH, prince of Brecknock, whose territory extended over a large portion of central Wales, and included the district between the Severn and the Wye.

In the reign of TEGYD, the son of the prince just named, the Welsh were driven out of this district by OFFA, who afterwards made the famous dyke as a mark for his new boundary.

The dyke begins at the mouth of the Dee, on its left bank, running south through parts of Denbighshire and Flintshire, cutting off a very small portion of the west of Shropshire. Passing into Radnorshire it is seen near Knighton, the Welsh name of which *Tref y Clawdd* means the "town on the cutting" or "ditch:" for both *Clawdd* and dyke come from verbs signifying *to cut.* We have it in the word *dock* to cut off; dock, the noun, a cutting for ships to ride in; *docket, ticket*; and possibly in *dog* as the designation of the *biter, i.e.,* the *cutter.* We also find it in the name *Pendock,* "Head of the dyke."

The Dyke goes next through the parishes of Norton, Whitton, and Discoed, near "Beggar's Bush;" then enters Herefordshire at the village of Knill, not far from Kington. It nearly surrounds a hill here, called Bervas' Bank, and is both deep and wide; the breadth being some 50 feet.

It is perhaps needless to remark that a rampart one hundred miles in length was not intended as a fortification over its every portion; but at intervals there are points in it of such strength as to leave no doubt that they were meant for military defence.

Leaving Kington the Dyke runs almost due south-east, to the Wye near Kenchester (the former Roman Station of *Magna*), and from here I think it keeps pretty near the river the rest of the way to Beachley; only leaving it to secure such stronger positions as the hills or cliffs at a little distance could afford.

It would perhaps be difficult to say why its termination at Beachley is carried across the Peninsula, instead of keeping down by the edge of the Wye to its very mouth; unless it was intentionally done to secure some neutral ground. That the ground *was* neutral we may gather from the fact that the Danes were allowed to land there and trade, both with the English and Welsh. Looking at the general direction of the dyke, we find it cutting a tolerably straight line southward, until it leaves Radnorshire, where it bears *away* towards the east, scarcely if at all touching the present county of Monmouth. This is to be accounted for from the powerful stand made by the Silures, who had never been so thoroughly subdued by the Romans, as had other British tribes; and who were regarded by those rulers of the world as among the most formidable foes they had ever had to encounter. TACITUS distinctly says so; and there is good reason to believe he speaks on the authority of his father-in-law, AGRICOLA, who had served against them under JULIUS FRONTINUS, the general who, CAMDEN thinks, constructed the Via Julia, or Great Roman Road through South Wales. Certain it is, that after the second Roman legion had been quartered at Caerleon and Caerwent for more than three hundred years, and during which time they not only "requisitioned" them permanently, but in all probability, drafted away numbers of the younger men to serve in the Cohorts in Egypt, Armenia, and other distant parts of the world; there still was life and will enough left among the Silures to keep the Saxons at bay, all through both Heptarchy and Monarchy. It is *possible*, therefore, (I do not put it forward as a fact, but *only* a possibility) that as the Silures were powerful enough to prevent OFFA from encroaching on their territory, they may have made their power felt sufficiently in the treaty of peace following OFFA's war, to compel him to reserve them *a sufficient landing place* on the English side of the Severn, to enable them to *use Aust Passage* in all states of the tide, or when "New" Passage would not be so safe; they of course guaranteeing neutrality for the piece of ground thus reserved. There are always two to a bargain, unless one is overwhelmingly stronger than the other; and we know from history that OFFA had no such superiority over the Silures; or he would have made his line on the *Usk* instead of the Wye, as the Romans did, speedily after their conquest of this part of Britain.

So far as regards that portion of it which lies in Gloucestershire, skirting as it does the natural boundary line of the Wye over much of its course, there is good reason to suppose that it keeps on the tract of far more ancient encampments. This was unquestionably the case with WAN's Dyke in Somersetshire, a section of which shews an older bank has been *added to.* SEYER thinks the increment due to the Romans; but this appears improbable.

It is pretty clear, looking at the general line of the Dyke, that even now, after all the political oscillations of ten centuries, it forms the real dividing line between the Saxon and Welsh peoples—OFFA's Dyke, and *not* any mere county boundary.

OFFA himself is described in the "Saxon Chronicle" as a direct descendant of ODIN in the 13th generation from him. Some will smile at this; yet there is no more reason for considering ODIN as a mere myth than the Duke of Wellington. But as he chanced to live in a period when Valhalla took the same position as Westminster Abbey does now, he passed into a god, on his demise, as naturally as he would have passed into a saint had he been 500 years later: the advantage he had in coming on the world's stage at such an early period being, that he secured one day in every week in his honour, instead of one in every year—"Wednesday" instead of "St. ODIN's day." In 1875 the utmost he could have expected to attain would be, not even a saint's day, but a volume of biography* and a funeral sermon by Dean STANLEY, as a "muscular christian" of no ordinary standing.

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* Life and Correspondence of the late General ODIN, with a photograph, and maps of his battle-fields. London: JOHN MURRAY.

Be this as it may, OFFA began his reign in 754, and ended it, according to the "Saxon Chronicle," in 793. The "Welsh Chronicle," which speaks of his deeds with good reason to remember them, says he died 796.

As he did not begin the dyke until some little time after the commencement of his reign, and a work of such magnitude could not have been accomplished in a day, we may take it to be just 1100 years since this rampart was made.

As an historical landmark then, OFFA's Dyke carries us back *more* than half way to the epoch of JULIUS CÆSAR's landing in Britain; and very nearly half way to the taking of Babylon by CYRUS in the fall of the first great empire of the world.

It is to be wished that some members of the Cotteswold Club would devote further time to the examination, in detail, of these oldest and most firmly established, *Royal British Banks.*

Note on the Black Rock at New Passage.
(From Coxe's *Monmouthshire.)*

The New Passage, which was in reality an *ancient* one was suppressed by Cromwell, on account of about 60 of his soldiers having been drowned there, in pursuing Charles I, who had ferried over from Black Rock to Chessel Pill. The boatmen who took the republican soldiers over in pursuit were loyalists, and purposely landed them on the English Stones, some little distance from the Gloucestershire shore, which can be reached from them at low water by fording a pool. The tide at the time in question was rapidly rising, and cut them all off.

The ferry remained closed till 1718, when it was renewed; but its renewal caused a lawsuit between the family of St. Pierre and the guardians of the Duke of Beaufort. Depositions were taken for this trial at the Elephant Coffee House in Bristol; and one of the witnesses, named Giles Gilbert stated as follows:—

"And this deponent particularly remembers that in the reign of King Charles the First it was reported that his Majesty crossed the said passage from the said Black Rock to Chishull Pill, and this deponent believes the same, for that this deponent saw him ride through Shire Newton, near the said passage, in order to cross over the same, and about one hour after his Majesty passed by he was pursued by his enemies, or Oliver's soldiers, whom this deponent saw hastily going near Portscuet, who, as this deponent heard, upon their coming up to the said Black Rock Passage, and there finding the King to have just passed over, drew their swords upon some boatmen belonging to the said passage, that were there, and forced them on board one of the passage boats, and the said boatmen carried them over, and landed or put them on shore on the rock, called the English Stones, on the Gloucestershire side of the said passage, near Cheshull Pill, and left them there, when the tide coming on them, they were all lost or drowned, as this deponent verily believes, and was credibly informed the very next day, by the boatmen who carried them over; when this deponent, upon the report of the accident, went down to the said passage to enquire into the truth thereof; and this deponent saith that he hath heard, and been informed, and believes, that the said passage was afterwards put down, by Oliver Cromwell on that occasion."

Coxe (p. 16) says Southbrook Chapel, on the west bank of the river, near the New Passage, probably belonged to a large mansion, now no longer in existence, for in the twelfth century John Southbrooke is mentioned as being entitled to house-boot and hey-boot, from the Conquest, for his house at Southbrooke. (Deed on the Chase of Wentwood.)

Within the memory of several persons living when Coxe wrote, Southbrooke Chapel was used for performing service. As his "Monmouthshire" was published in 1801, if we go back 40 or 50 years, we shall make the date of its being in a perfect condition 1750 or 1760.

Caldicot Castle. *By* John Bellows.

Although the magnitude of its ruins attest its former importance, very little indeed is recorded in history of Caldicot Castle. Some have hazarded the conjecture that the present building stands on the site of a more ancient one, erected by King Harold; but there is no reason to suppose that Harold built in this spot at all. He did erect a hunting lodge at Portskewett, in 1065 (one year before the Conquest), and the "Saxon Chronicle" gives an account of his inviting King Edward (Edward the Confessor) to come to it for a grand hunt and feast; for Harold, we are told, had stored much good there, ready for the occasion, Caradoc ap Griffith, Lord of Caerleon, did not see the advantage of this arrangement, and during Harold's absence in Wentwood made a descent on the lodge, killed the workmen and servants he found there, appropriated the "much good" that was stored up, and pulled the house down. This event occurred exactly 810 years ago. (Written in 1875.)

No mention is made of the Castle in "Domesday," though the estate of Caldicot is named in it,—"Durand the Sheriff holds of the King one land in Caerwent, called Caldicot. He has in demesne there three ploughs, and 15 half villeins, and four bondmen, and one knight. All these have 12 ploughs. There is a mill worth 10s. The whole is worth £6." This Durand was Sheriff of Gloucestershire.

The first date at which we find mention of the Castle is 1221, when, according to Dugdale, "Humphrey, Earl of Hereford, did homage, and had livery of his Castle of Caldicott." This must have been in the reign of Henry the Third. The Saxons in the time of HAROLD had made themselves masters of Caerleon, Caerwent, Chepstow, and Monmouth; and the Norman Barons appear to have retained these places, from whence, by a series of raids, they at length mastered the whole country, which at that period was known as GWENT. It was not till the reign of HENRY II that the line of petty princes who had ruled over Gwent became extinct,—say some 60 years before the date I have just quoted as that in which the first mention occurs of the Castle of Caldicot.

The HUMPHREY DE BOHUN, to whom the Castle then belonged, was the fifth Earl of that line, and went by the *sobriquet* of the Good Earl of Hereford. He died in 1275, and was buried before the high altar in the priory of Llanthony.

The fifth descendant of this good Earl of Hereford, also a HUMPHREY DE BOHUN, died in 1373, leaving two daughters, of whom the elder married THOMAS DE WOODSTOCK, Duke of Gloucester, and the younger HENRY DE BOLINGBROKE, who afterwards became King HENRY the Fourth.

This Duke of Gloucester obtained the Earldom of Hereford, and the High Constableship of England, and came into possession of Caldicot Castle.

The Duke's inordinate ambition got him into trouble, which ended in his being murdered. As FROISSART says in his "Chronicle," "When he had dined, and was about to have washed his hands, there came into his chamber four men, and cast suddenly a towel about the Duke's neck, and drew so sore that he fell to the earth, and so they strangled him, and closed his eyes." This was in 1397, in the time of RICHARD the Second, who is believed to have been at the bottom of the affair.

Caldicot Castle was at this time possibly confiscated to the crown, as the Duke of Gloucester was under an attainder for treason.

He left one son, who died without issue; and his daughter became co-heiress of the de Bohun estates. She married EDMUND Earl of Stafford, and ancestor of the celebrated, but unfortunate, HENRY Duke of Buckingham. This Earl Stafford was killed at the battle of Shrewsbury, and died seized of Caldicot Castle.

Soon after the accession of HENRY V, the De Bohun estates were divided by Act of Parliament between the King, as heir of his mother (the younger daughter of HUMPHREY DE BOHUN), and the Countess of Stafford, as heiress of the elder daughter, who married the Duke of Gloucester. The Castle in this division fell to the share of the King.

On the attainder of HENRY VI (about 1461), Caldicot Castle was transferred to EDWARD IV, who granted it to Lord HERBERT of Raglan, for his services against the House of Lancaster. He was killed at the battle of Banbury, when the Castle reverted for a short time to HENRY VI, and then it was again taken possession of by EDWARD IV.

RICHARD III restored Caldicot to HENRY Duke of Buckingham, who was lineally descended from the Countess of Stafford, and therefore from the DE BOHUNS. He was beheaded at Salisbury, for his opposition to RICHARD, and his son HENRY became heir to Caldicot. When the latter was beheaded, through the intrigues of Cardinal WOLSEY, in 1521, the Castle was annexed by HENRY VIII to the Duchy of Lancaster, to which it has ever since belonged, being leased from time to time like the other estates of the Duchy. During the reigns of ELIZABETH, JAMES, and CHARLES the First, it was leased to the Earls of Worcester; but it could not have been kept in use, since in 1613 a jury, who had to report on its value to a court then held, stated it was "*ruinous and decayed*," that it had been in this condition before their memory, and that they could give no account of the cause of its decay. This, we may reasonably infer, would carry back the period of its ruined condition to the beginning of the reign of ELIZABETH—she ascended the throne in 1558, three years before this court was held.

Now as the Duke of Buckingham was beheaded in 1521, it appears very probable that from the time of the Castle being confiscated to the King it had never been used; so that we may conclude it fell to ruin in the latter part of the reign of HENRY VIII; say 350 years ago. Besides this, the sum at which it was leased, even after allowing for the difference in the value of money, looks more like a payment for the lands belonging to it, only, than for a habitable Castle of such magnificence—*i.e.*, £52 13s. 4d. (about £800 a year of present value).

In this hasty sketch I have done little more than transcribe the facts recorded in the "Saxon Chronicle," Coxe's "Monmouthshire," and one or two other works.

As to the architectural features of the building, the less I say the better, for it is a subject I have not studied. I may just draw the attention of the Club, however, to the manner in which the facings have given way in the upper part of many of the windows, revealing the fact that the Gothic arches in these windows are in some degree shams,—that is, the real weight or strain of the stonework above is *not* borne by the arch itself, but by the more ancient method of gaining over from each side, and capping the approaching stones with a large *flat* one, which distributes the strain over a larger surface. The principle is exactly the same as that adopted in the great pyramid, where in the King's chamber, above the flat polished granite ceiling, the weight of the whole superincumbent mass of the pyramid is staved off by this system of "gaining or corbelling over" with flat stones.

There are some handsome fire-places in some parts of the Castle—in one of which may be noted the employment of herring-bone work, which Coxe thinks indicative of a very early period. It is evident, however, that this is done merely as an exceptional ornament, which might have occurred to an architect of any period.

The keep is in the northern angle; the baronial hall probably stood on the right of the principal entrance (going in). The slides for the portcullis in the great gateway are remarkably perfect. The gate in the keep tower has not only the grooves but the holes for the portcullis or chain of the drawbridge quite perfect. The tower on the left of the building (*i.e.*, nearest the village) shows very clearly the corbels for carrying the wooden gallery used in mediæval siege work, for protecting the defenders of the Castle, while they poured molten lead or other murderous missiles on besiegers in the moat. The manner of erecting and employing this "Hourdage" is shown in a spirited sketch in Viollet le Duc's "Great Dictionary of Architecture."

Wyndham, in his "Tour in Wales," dismisses Caldicot Castle in a single line, by saying that there was nothing about it either interesting or picturesque. I think I may count on the support of every member of the Cotteswold Club who has seen the ruin in dissenting entirely from this view. Little as we know of its history, yet that little is linked with great and famous names in the history of England; and whether we regard the beautiful chiselling of some parts of its stone-work, which has stood the test of so many centuries, or the effect of the *tout ensemble* of masonry, and the luxuriant vegetation which everywhere mingles with it, we are bound to say that Caldicot Castle in its ruin is both picturesque and beautiful.

Annual Address to the Cotteswold Naturalists' Field Club, read at the Spread Eagle Hotel, Gloucester, on Thursday, 24th Feb., 1876, *by the President,* SIR W. V. GUISE, BART., F.L.S., F.G.S., &c.

GENTLEMEN,—It is my agreeable duty to make a report in all respects satisfactory of the present condition and future prospects of the Club.

I have been constrained to call you together at a somewhat earlier period of the year than has been of late years usual, and this has not permitted the new number of our "Transactions" to be prepared in time for presentation to members on this occasion; I am assured, however, that it is in a good state of forwardness, it will be issued very shortly, and will prove a good and full number; it will complete the volume, and will contain a photographic portrait of your President, for which he was specially requested to sit.

As regards finance, our Honorary Secretary reports that we have spent very little during the year; and the Annual Meeting being a month earlier than usual, he proposes to pay for the "Transactions," to settle all other accounts, and to prepare a balance-sheet that will include all receipts and disbursements up to the 25th March, to be printed and sent out with the "Transactions."

Our numbers are reduced by death and retirement to 87. It is, I am sure, with regret that the Club will learn the retirement, through ill health, of one of our oldest members, Canon LYSONS, who I believe has been associated with us since the earliest days of the Cotteswold Club. Capt. JONES is dead, and Mr. GRAHAM CLARKE and Capt. WINTHROP have resigned, having quitted the neighbourhood.

With these prefatory remarks I will proceed to give a summary of the proceedings of the Club at the various Field-meets; premising that if a certain want of novelty and freshness be observable in my record, it is in a large degree due to the fact which forces itself upon us more and more every year, that we are gradually ransacking every cranny and corner of the district which is within our reach by road or rail within the compass of a day's journey. It becomes therefore increasingly difficult to arouse interest in mere locality, and we must rely more and more upon the efforts of members to work out minute facts of scientific interest in their different localities; and thus—for nature is inexhaustible—to supply fresh sources of interest besides those derivable from mere scenery and its surroundings, which, though admirable for giving zest to a gathering on a fine day, is far from being the *raison d'être* of such Societies as ours. Of those who are doing such good work I would especially mention our colleague the Rev. F. Smythe, who, in his quiet parsonage at Churchdown, has occupied himself in the study and correlation of the beds of the Middle Lias, and is preparing a memoir which will do credit to the published "Transactions" of the Club.

THE ANNUAL MEETING OF THE CLUB

was held at the Spread Eagle Hotel, Gloucester, on Tuesday, 16th March, 1875, when you again did me the honor to elect me for your President, with Dr. Wright and Mr. Lucy as Vice Presidents, and Dr. Paine as Honorary Secretary. The Meeting, which was well attended, was not marked by any exceptional features. After dinner the Rev. F. Smythe offered some observations upon early tobacco-pipes, and was followed by Mr. John Bellows with an interesting account of Roman Gloucester, a subject to which he has devoted great attention for some years, and by a careful comparison of existing traces and those which from time to time have been revealed by well-sinkings, foundations of houses, and other excavations, with the measurement and rules for castrametation laid down by Polybius and other Roman authorities, he has been enabled to restore, with every probability of a fair approximation to truth, the original boundary-wall of the ancient Roman oppidum, with the position of its streets, gates, and principal public buildings. I am glad to know that this will form the subject of a paper by Mr. Bellows, which will appear in the next fasciculus of our "Transactions."

The first Field Meeting for the season was held at

CHEPSTOW,

on Thursday, 20th May. The programme for the day included a visit to the earthworks known as OFFA's Dyke at Sedbury, and the examination by the Geologists of the Cliff at Beachley, which presents a twin section to that at Aust, on the opposite side of the Severn. The morning proved exceedingly wet, which caused the absence of many who had communicated to the Secretary their intention of being present. Some 16 or 17 however presented themselves at the appointed rendezvous, and were rewarded by the enjoyment of perfectly fine weather during the remainder of the day. A brake and pair of horses conveyed the excursionists to Sedbury, where the mound known as OFFA's Dyke is intersected by the road to Beachley. Here it was announced that a telegram had been received from the Rev. Mr. ORMEROD, the proprietor of Sedbury Park—(it has since passed out of his possession by sale)—to the effect that the house would be open for the inspection of the Club, together with certain Roman antiquities found in the neighbourhood of the Dyke by his predecessor, the late learned Antiquary and Genealogist, Dr. GEORGE ORMEROD, who applied all the energies of his keen and well-trained observation to the unravelling of the ancient traces of Roman and British occupation in the neighbourhood of Chepstow, which are embodied in a series of memoirs communicated to the "Archæologia" and other publications, and since collected in a privately printed volume, under the name of "Strigulensia," from "Strigul," the ancient name of Chepstow.

Time did not admit of long delay; but the party, besides inspecting the Roman relics, had an opportunity of admiring the well-stocked library of goodly tomes (all since dispersed) and all the pleasant surroundings of trees, park, and pleasure grounds, at once so beautiful and so characteristically English, to which the fresh green of spring imparted an additional charm. The Section at Beachley Cliff, though closely resembling that at Aust, yet presents differences which give it a certain speciality.

The exposure of Lower Lias is considerably greater, and abounds in such characteristic fossils of the formation as *Lima gigantea*, *Ammonites planorbis*, and its thicker variety *A. Johnstoni*, *Ostrea Liassica*, &c. The Rhætic beds resemble very closely those at Aust—the "bone-bed" is but feebly represented—*Avicula contorta* is present occasionally. All these beds are more accessible than at Aust, the exposed thickness of Red Marls being considerably less.

The members and friends dined together at the Beaufort Arms, Chepstow. After dinner Dr. Wright gave an account of a remarkable discovery in connexion with Rhœtic geology, which will form the subject of a paper in this year's issue of our "Transactions." A few months previously Dr. Wright had received from Berlin a parcel of fossils for identification, derived from the Rhætic series of Hildesheim. Amongst these he found a new species of Brittle-Star (*Ophiura*), to which he gave the name of "*Ophiolepis Damesii*." Some weeks subsequently a party of students belonging to the School of Science at Gloucester, after hearing a lecture by Mr. Lucy, proceeded to Garden Cliff, Westbury, for a day's geologising. They were successful in finding all the characteristic fossils of that well-known Section, and wonderful to relate—seeing that the ground has been worked by Geologists so long and so thoroughly that it would seem scarcely possible any novelty could turn up—they found several examples of a small Star-fish, which, being sent to Dr. Wright, was by him recognised as identical with his *Ophiolepis Damesii* from Hildesheim. This discovery imparts a new interest to the Rhœtic series, at least to that portion of them which has hitherto been found in this country. Doubts had arisen both here and on the Continent as to the conditions of the sea in which its organisms dwelt, a fresh water character having been claimed for it—such was the opinion of Edward Forbes—and until the discovery of these Ophiurites there was no decisive evidence to the contrary. The presence however of these little brittle-stars is decisive of the marine character of the beds in which they were found. Those at Hildesheim were found between the "upper and lower 'bone-bed,'" in association with bones of *Hybodus*.

A paper was read by Mr. Playne "On the Ancient Camps in Gloucestershire." Their number he gave as about 80, of these he had visited more than 60, and with a large number of them he was of opinion the Romans had little or nothing to do.

Mr. Bellows had prepared a paper upon "Offa's Dyke," which there was not time to read, but it appears in our "Transactions."

The second Field Meeting which, by previous concert, had been arranged should be a joint one with the Woolhope Club, was held at

SYMONDS YAT,

for Ross and Monmouth, on Tuesday, 15th June.

Not having been present on that occasion, I am indebted to our Secretary for an account of the day's proceedings, which seem to have been sadly marred by foul weather, which however does not appear to have acted as a deterrent, more than 30 members of the Cotteswold Club having presented themselves at the Ross Station, where they were joined by a strong contingent of Herefordshire Naturalists. The Botanists of the party seem to have found at Symonds Yat a rich locality for rare plants. A party of Cotteswold Geologists took the pathway leading through the wood to English Bicknor, to inspect the celebrated "Boulder," said to be of Coal-measure Sandstone, and if so, to have been transported to its present position by the agency of ice, at what was probably a late stage of the Glacial epoch, and at a period when the surface of the country was much the same in its general outline as at present. But on rejoining their friends these daring sceptics did not scruple to declare their belief that this "Boulder" was in truth no "Boulder" at all, but a mass of "Millstone Grit," of which there was plenty in a quarry hard by, and with which the hill appeared to be capped. "As however," adds my informant, "the 'Boulder' is now "classical, and has heretofore been examined and described by "very accomplished Geologists, we will not lay too much stress "upon an opinion formed from a very hasty examination, made "in the intervals of a rattling thunder-storm."

From the top of Symonds Yat the route lay over the ridge of the hill to the Buckstone, which was the next point of interest in the programme.

The Buckstone is a large detached mass of Old Red Conglomerate, and one of several such masses which have from time to time rolled down the slope of the hill towards the Wye valley below. Its greatest length is about 19 feet, extreme breadth 13, and circumference about 55. It is so nicely balanced that a little force will make it vibrate; and it is on that account one of the most celebrated "rocking-stones" in the kingdom. The marls below the Conglomerate mass have been so washed out and denuded away by atmospheric agencies that the stone itself appears to stand almost on a single point, and it looks as if it might easily topple over, and fall with a crash into the valley below. On this occasion however the celebrated "Logan" served a useful purpose, in affording a partial shelter to some 30 half-drowned Naturalists during one of the fiercest storms known in the west of England for many years.

Monmouth was next reached, and after an hour spent there, the Club proceeded to Ross, and dined at the Royal Hotel, under the Presidency of the Rev. C. J. ROBINSON, President of the Woolhope Club. After dinner a very able paper was read on the "Botany of the District," by Mr. H. SOUTHALL, which was followed by an interesting discussion; after which Dr. WRIGHT, in following up some observations of Dr. PAINE's on *Ophiolepis Damesii,* gave an eloquent and instructive address on the Rhœtic area—the "bone-beds," and the conditions which must have prevailed at the time of their deposition.

The Meeting appears to have been one of profit and interest, and to have been carried out with undaunted resolution in the teeth of a furious gale of wind, and an unprecedented rainfall, equal during the day to sixty tons of water per acre.

The third Field Meeting of the Club was held by special invitation from our old and valued colleague Rev. W. S. SYMONDS, at

PENDOCK,

on Tuesday, 20th July.

About 24 members of the Club assembled on the day appointed at the Gloucester Station, at 9.30 a.m., where two carriages were in waiting for the service of the party during the day. Their first halt was at Redmarley, where the Rector, Mr. NIBLETT, was in waiting to shew them the Church, which, having undergone recently complete renovation, was interesting to all except the Antiquary. A monumental brass within the Church attracted a good deal of attention, being that of GEORGE SHIPSIDE, who was brother-in-law to Bishop RIDLEY, whom he accompanied to the stake. SHIPSIDE died in 1609. Two remarkable yew trees in the churchyard are likewise deserving of notice. From Redmarley the party proceeded to Hazeldine, the pretty residence of Lady ROBERTS, where refreshments were served, and a short address was delivered by Mr. SYMONDS, on the geological features of the day's ramble. He drew attention to the geologic history and the legendary lore of the beautiful country around the southern Malverns; he described the "fault" which at Hazeldine brings up the Lower Keuper Sandstones against the Lower Keuper Marls—a "throw" of between 200 and 300 feet; and explained the relation of the Keuper Rocks generally to the Oolitic Rocks of the Cotteswolds and of Bredon Hill, the Lias of Corsewood and Hasfield, and the liassic outliers of Sarnhill and the Berrow. He then drew attention to the position of some thin pebble-beds at the base of the "Waterstones," which he had visited the previous week, in company with Professor PRESTWICH. This bed contains quartzite pebbles identical in character with those in the well-known pebble-bed at Budleigh Salterton, in Devonshire; and Capt. ROBERTS had been so fortunate as to find traces of fossils, thus bringing the analogy still closer.

The walk to Haffield led the party over the Bromsberrow Sandstones. These dark red beds are seen to dip under the "Waterstones" of Redmarley. The drifts near the Dick House were next visited, and the section near Clincher's Mill was pointed out, where Mr. SYMONDS explained the views of Professsor PRESTWICH respecting the masses of local *débris* overlying old river-beds charged with ice-borne erratics. He shewed the spot, where, in a quarry now closed, he once pointed out to Mr. LUCY a large erratic block of "Wenlock" Limestone stranded amidst pebbles of "Northern Drift," and accompanied by other fragments of local erratics.

The Section in the Permian breccia at Haffield was next visited, and the relation of the Permian rocks to the "Old Red" behind, and the "Bunter" beds before them, was pointed out. The luxuriance of the arboreal vegetation at Haffield was greatly admired; the mildness of the climate, too, was evidenced by the presence on the rocks of *Cactus Opuntia* (Prickly Pear), and the *Cistus* (Rock Rose); while the Conifers had evidently found a thoroughly congenial habitat, an individual of *Pinus Douglassii*, in particular, being remarkable for size and beauty.

A short halt was made at Bromsberrow Rectory, the residence of the Rev. R. P. Hill, from whence the party proceeded to Pendock, where dinner awaited them in the village school-room, which was prettily decorated for the occasion. A company, about 35 in number, amongst whom was the Rev. T. Pritchard, Savillian Professor of Astronomy at Oxford, sat down to table.

After a few toasts suited to the occasion had been offered and responded to, Mr. Symonds resumed the remarks on the geology of the district, which he had commenced at Hazeldine, after which, at the request of Mr. Symonds, your President gave a sketch of the geology of Auvergne, to which he had lately made his fifth visit. His observations were usefully supplemented by those of Mr. Teale and Professor Pritchard, both of whom spoke with enthusiasm of the beauty and interest of that remarkable district.

The fourth and last Field Meeting for the season took place on Tuesday, 17th August. The programme for the day comprised an examination of the tunnel-borings at

PORTSKEWET,

and a visit to

CALDICOT CASTLE, and CAERWENT.

Leaving Gloucester by the 9 a.m. train, the party found carriages awaiting them at Chepstow, by which they travelled to Portskewet. At this latter place the Great Western Railway Company are prosecuting their great work of passing under the Severn by means of a tunnel more than four miles in length. From a geological point of view the workings are of great interest, as owing to the disturbed condition of the strata, the section of rocks to be penetrated constitutes an unknown problem not very easy of solution; and as the ultimate success of the scheme depends largely on the nature of the section, every yard of the work is of great and increasing interest.

The party was received by the engineer of the works, who was at much pains to explain the mode of operation, the sucession of beds, and the nature of the obstacles to be anticipated. The succession of beds at that time passed through was given as follows :—

Drift	6 feet.
Yellow Sandstone	9 feet.
Red Marl	70 feet.
Hard Conglomerate	4 feet.
Pennant	16 feet.
Clay Shale	35 feet.
Coal Seam	a few inches.
Coal Shales	10 feet.
Stone	10 feet.
Fire Clay	10 feet.
Limestone and Shale...	10 feet.
Ironstone	20 feet.
Head of Tunnel	5 feet.
Total	205 feet.

The "shoot" is kept clear of water by a powerful pumping apparatus, which discharges a large quantity of brackish or saline water, the saltness of which increases with the flow of the tide, shewing thereby infiltration from the Severn. In the deepest part of the river-bed there is a depth of 60 feet of water at low tide, and 100 feet at high tide; an amount of pressure which, combined with the probability of "faults" to be met with in the strata, suggests cause for reflection, if not for apprehension. But the engineer had no fears. It is without doubt a bold work, and one which will be watched with great interest by the public, as well as by scientific men. Mr. Lucy drew attention to the "*Conglomerate*" which constitutes the fourth bed in the foregoing series, to which he was disposed to suggest a Permian origin, placed as it is between the "Red Marls"—here belonging to the Upper Keuper series—and the Pennant rock of the Coal-measures. The "Conglomerate" in question, which is only four feet thick, is made up of rolled pebbles derived from the Pennant, Carboniferous Limestone, and Old Red. Mr. SYMONDS being appealed to, was disposed to regard this as a Triassic Conglomerate; he altogether agreed with Mr. LUCY as to the Conglomerate occupying the *position* of a Permian rock overlying the Palæozic series.

From the tunnel the party proceeded to examine the Camp at Sudbrook, passing by the way the remains of an ancient Chapel, of which very little seems to be known; it appears to date from the 12th century. The Camp consists of two converging lines of earthwork, with a double vallum and foss, enclosing a triangular space, of which the base is formed by the rocky cliffs on the Severn. That this was used by the Romans is certain, but the structure of the ramparts points to an earlier origin. Placed on a projecting point overlooking a flat alluvial plain below, the position seems well selected for the protection of shipping, of which Portskewet was probably a principal station. The connexion of this important passage with the Roman lines of road on both sides of the estuary, opens up the whole question of the system of fortresses and communications by which the Romans kept in subjection the restless tribes on both sides of the Severn. In illustration of this theme Mr. JOHN BELLOWS read a paper on the Roman roads on the Lower Severn, pointing out that they formed part of a great system, which can only be understood by tracing the lines of communication to their principal centres, and showing how, by a system of signals and outposts, troops could be rapidly moved and massed on the threatened points. His explanation, too, of the derivation of the names applied by the Romans to the British tribes was both ingenious and instructive.

From this point the party went to Caldicot Castle, now a mere shell, but stately and picturesque of aspect in its ivy-clad decay. The Church, too, was visited. What it may have contained of interest previous to its renovation cannot be told, but its present state is one of despair to the Antiquary.

From Caldicot a drive of a couple of miles or so brought the party to Caerwent, the *Venta Silurum* of the Romans, which, together with Carleon (*Castrum Legionis*), formed the chief strongholds for keeping in subjection the warlike tribes of the Silures. The walls which enclosed the Roman fortress are still in existence, and present to the eye a national monument of the highest interest. It is probable that they owe their preservation to the sparse population of the locality; and though many a neighbouring wall has been built with the stones of the Roman fortress, there has happily not been sufficient demand to cause the demolition of the ancient structure. This is one of those instances in which such a law as that introduced by Sir John Lubbock would protect from further spoliation all that still remains of the most perfect example of a Roman walled town in Great Britain.

The drive from Caerwent to Chepstow was accomplished in rain. At Chepstow the party dined at the Beaufort Arms. After dinner Mr. J. Bellows completed the remarks which he had commenced at Sudbrook Camp. Some observations were made by Mr. Lucy and Mr. Symonds on the geology of the tunnel; and by the President on the Roman lines of passage across the Severn. He urged upon members the importance of securing, before time and cultivation had entirely erased them, the vestiges of Roman occupation on the Lower Severn, and of illustrating the same by a map and memoirs.

Having now passed in review the work done, and the ground traversed by the Club during the past year, I think it may fairly lay claim to having been as useful in its results as any of its predecessors; and as regards contributions to our "Transactions," the interesting quality of the papers which will be comprised in the next issue will bear witness to the industry and observant powers of several of our colleagues. That this spirit of observation may be nourished and extended in the future should be the special object of every good Naturalist and every earnest member of the Cotteswold Naturalists' Field Club.

Address to the Cotteswold Naturalists' Field Club, by the President, Sir W. V. Guise, Bart., F.L.S., F.G.S., *read at Gloucester on the* 10*th April,* 1877.

Gentlemen,—

The Address of your President which annually signalizes the opening of the season for Field Meetings of the Club—now in the 32nd year of its existence—may fitly commence with an expression of thankfulness at the healthy condition and favourable prospects of our Society. The Secretary reports that the finances of the Club are in a fairly satisfactory condition. The amount received during the past year has been £93 0*s*. 0*d*., while the disbursements have amounted to £72 6*s*. 9*d*., and this includes the whole cost of printing, publishing, and illustrating the last vol. of Transactions. This would have been considerably more, but for Mr. Bellows's liberality in greatly reducing the charges incurred in illustrating his own valuable paper.

Arrears of Subscriptions have come in much better during the past year, but nearly £90 still remain due, under this head, though the Secretary believes that this amount will be much reduced by midsummer.

As it will be necessary at once to prepare a new list of members, which has not been done since 1875, it is intended, with this list, to send a detailed Statement of Account and printed Balance Sheet to each member.

As regards our numbers, though there has been some diminution by deaths and resignations, these vacancies will be shortly filled from the list of candidates awaiting election. Of those who have been taken from us by the stroke of death, occur the names of two of our oldest and most valued associates, Mr. DAVYD NASH and the Rev. Canon LYSONS, whose merits call for more than a passing notice at my hands.

Though ill-health had of late years deprived the Club of the presence of Mr. NASH, his memory will be kept alive amongst us by the recollections of his great and varied abilities, and of his genial humour. Of the latter quality our Transactions contain capital samples in "A day with the Cotteswold Club" and other witty rhymes, in which his facile pen has described in the happiest manner, some of those pleasant incidents, which, while they add a zest to our labours, relieve with a touch of the ludicrous the more grave and earnest pursuits in which we are engaged.

From a notice in the Cheltenham Examiner, I learn that DAVYD NASH was a Bristolian by birth, and was at first designed for the practice of medicine, with which view he was specially educated at the London University, where he distinguished himself by carrying off all the honors and medals for which he competed. As a consequence, he at once obtained a Cadetship and a good appointment in India, which however, he was obliged to resign through ill health. On his return to England he abandoned the medical profession and turned his attention to the law, entering at the Middle Temple. In due time he was called to the bar, and practised with success, both on circuit and in the local courts at Bristol, in the neighbourhood of which city he had, after some stay in Cheltenham, for a time settled. During that stay in Cheltenham, Mr. NASH took an active part in promoting the objects of the late Literary and Philosophical Institution, before the members of which body, he delivered the first course of lectures on geology ever given in Cheltenham, and at one of the Society's meetings unrolled and described the only Egyptian Mummy ever brought into the town, which is still preserved in the museum of the

General Hospital. He also, about the same time published a very clever pamphlet on the iodurated waters of our Spas. In after years, while residing at Clifton, he occupied much of his leisure in cultivating an acquaintance with Celtic literature, acquiring especially an intimate knowledge of the poetical remains of the ancient Welsh Bards preserved in the Myvyrian Archæology. The results of his researches into these remains were given to the world in a handsome 8vo volume, entitled 'TALIESIN,' which caused no small sensation amongst the Welsh literati; challenging as it distinctly did, the import of the mythological poems ascribed to 'TALIESIN,' Merlin, and others of the early bards, and repudiating altogether the commonly received opinions as to their great antiquity. This work was favourably reveiwed in the '*Times*' and in most of the literary Journals of the day. In social and literary circles he was ever a welcome guest. He married a Miss FOWLER of a wealthy Bristol family who, with six children, survives him.

The Rev. SAMUEL LYSONS, Rector of Rodmarton, honorary Canon of Gloucester Cathedral, and lord of the manor of Hempsted, was an eminent scholar, linguist, and antiquarian, whose published works are many. He was the eldest son of the Rev. DANIEL LYSONS, F.R.S., the eminent antiquary, author of 'Magna Britannia' and many other important works.

Amongst the published works of the late Canon may be enumerated "Claudia and Pudeus, or the early Christians in Gloucester, a tale of the first century," also, "The Romans in Gloucestershire, and the results of their residence in that county considered in an historical, social, and religious point of view; embracing the interesting question whether or not we owe our early Christianity to our intercourse with them, and whether St. Paul himself preached in Britain, and possibly at Gloucester." These works were rather mercilessly dealt with by some of the Metropolitan critics. Another of his books bore the title of "The Model Merchant of the Middle Ages, exemplified in the story of Whittington and his Cat."

Under the title of "What has Gloucestershire achieved?" he gave an enumeration of some of the principal events in which this county has taken a prominent lead; and under the title "Gloucestershire Illustrations—Machin and Madeira" he published "an attempt to investigate the truth of the romantic and interesting discovery of that island" in 1344 by Robert à Mackin, Machin or Machen, a Gloucestershire man in the Cog *La Welyfare*, of Oldbury-on-Severn. He also published a paper on "Languages—Our Vulgar Tongue"—"Conjectures on the Patriarch Job"—"Æsop's Fables Criticised," and other works.

THE ANNUAL MEETING

of the Club was held at the Spread Eagle Hotel, Gloucester, on Thursday, 24th February, 1876.

The President read his Annual Address, after which the customary election of officers for the ensuing year was made, when you were pleased to testify your confidence in the previous office-holders by re-electing them.

The Field Meetings for the season were then fixed, after which, Dr. Smythe of Churchdown read a paper entitled "The Spinatus Beds (Middle Lias) of the North Cotteswolds."

It was illustrated by a coloured section of the zone of *Am: Spinatus*, and by various tables of the fossils proper to this subdivision. Under the several headings of Lithology, Palæontology, etc., the author showed with much elaborate detail that the correct position of these beds, is immediately above, yet connected with the '*Margaritatus*' division of the Marlstone, and that it has often been confused with that zone, from which it is altogether distinct lithologically, and separable even in respect of life conditions.

Beginning with the beds at Churchdown Hill, which he has worked for many years, the author traces the '*Spinatus*' beds throughout England to the North-East coast, then through Ilminster to the South-West at Golden Cap, where they present a thickness of about 70 feet. Concealed from observation by the Channel, they are only feebly developed in Normandy, the Cote d' Or, Provence, and the Rhone district, owing to physical causes which prevented the accumulation of liassic sediments as a shore deposit. In the Jura Salinois they are known as the "Marnes a Plicatules." They are also well marked in Wurtemberg and other parts of Germany as well as in Hungary, but only on the coast lines, and conterminous with the areas of certain liassic basins. A review of the fossils indicates a zone of life, lying in shore, or near the coast line, belonging to the Laminarian zone of Professor FORBES (about 15 fathoms deep). Many of these forms are new, and all are interesting. It may be remarked that the division of the Middle Lias here treated of, has hitherto been much overlooked by geologists, who, besides, have often regarded these beds as appertaining to the Upper Lias, from which they are sharply divided off, or else they have grouped them with the so-called Marlstone or "*Margaritatus zone*," and thus they have come to be esteemed of little or no significance.

While treating of this paper of Dr. SMYTHE's, it may not be out of place to draw attention to other work by Dr. SMYTHE in the same field, which should not be passed over without notice by Cotteswold geologists.

The part just issued by the Palæontological Society, contains a supplement, or rather, the first instalment to the supplement to the British Jurassic and Triassic Brachiopoda, which deals very minutely with the Cotteswold country, especially Churchdown; the preparation of which has involved an amount of painstaking work on the part of all concerned, that is truly astonishing. This work, in which our colleague, Dr. SMYTHE, has been intimately associated with Mr. DAVIDSON, has cleared up many doubtful points, and has established, without doubt, the very great importance of Churchdown, as a Palæontological station.

While on this subject I would draw attention to the fact, that one result of the labours of Mr. DAVIDSON and Dr. SMYTHE in this field, has been the settlement upon a firm basis, of the vexed question of the affinities of '*Terebratulæ punctata*,' of which, appears faithfully figured, a new form which occurs at Haresfield, from which locality the variety has received the name of Haresfieldensis. The result is that '*T. punctata*' having got rid of the synonyms '*Subpunctata*' and '*Subovoides*,' stands as finally arranged thus:—

T. PUNCTATA *Varieties*
Edwardsii
Radstockiensis
Haresfieldensis

These are all well marked and distinct forms.

Another interesting point is the discovery at Churchdown of '*Waldhemia Maria*' D 'Orb,' in the "*Margaritatus*-zone," Middle Lias. The species "*W. Subnumismalis*" is also found in the same locality.

Mr. John Bellows read a paper on Roman Gloucester, which, having been since published with all its beautiful illustrations in the Transactions of the Club, is now in the hands of all members, and each one is able to judge for himself of the value and importance of the work done. It is not too much to say that no such paper has ever been produced which equals it in learning, research, minuteness of detail, and as an illustration of Roman occupation of so important a centre as Gloucester.

The importance of this paper has been recognized by German Archæologists, one of whom, Dr. Hübner of Berlin, notices Mr. Bellows's paper in a German Archæological Journal. Dr. H. does not agree with our colleague in all his conclusions, but he considers the finding of the Roman Station of Glevum an important addition to the early history of Britain, and adds that he wishes the Germans would work out their remains as thoroughly.

The First Field Meeting of the Season was held at

NEWNHAM,

on Tuesday, 16th May.

Having been absent on the Continent, I am indebted to a colleague, for the following report of the day's proceedings.

The Members assembled at Newnham where they were met by a break and other conveyances, which took them through

Blakeney to Blackpool Bridge, where an ancient paved way crosses the turnpike road, the examination of which was the chief object of the day's excursion.

This paved way once formed part of the grand system of roads by which the military power of Rome was maintained in Britain.

Leaving the carriages, the members of the Club followed the track of the Roman Road for about a mile and a half to Soudley Green. Beginning near the brook, it was noticed that a bifurcation was made in the line of way—part of the pavement running directly across the stream, and part over a little bridge to the right. The pavement is sadly mutilated, being sometimes wholly wanting for a considerable distance, and then partially re-appearing. What makes this line of road of special interest is, that it formed part of the *Via Julia,* the great Roman way from the province of Britannia Prima through the country of the Silures, or tribes inhabiting South Wales. When the Romans invaded Britain under Claudius, in the year 42, their conquest only extended as far as the River Severn. They had an idea that the difficult and intractable Silures could be kept within the limits of their own territory by the garrisons placed in the Cotteswold district and at Gloucester. In this they were mistaken. Tacitus informs us that the Silures made repeated incursions into the Roman Province, doubtless plundering the inhabitants; and this went on for some 30 years, till Vespasion ascended the Imperial throne. He had served as an officer in the second legion in Britain, and, with his brother Sabinus, had taken a very active part in the subjugation of the country. Knowing the resolute character of the Silures, and the mountainous nature of the country into which they would retreat in case of attack, he selected one of the ablest generals in the Roman service to undertake their conquest. This was Julius Frontinus, who, accordingly, became Pro-Prætor, or Commander-in-Chief of the forces in Britain. Tacitus records it as an astonishing thing, considering the difficulties by which he was surrounded, that he should have succeeded; but at all events he did succeed in compelling the Silures to submission; and to keep them quiet for the future, he moved the second Imperial

Legion forward from the province of Britannia Prima, into the midst of their country. We are told by another historian, Ptolemy, that the city in which the 2nd Legion was placed was Isca, which, as the Roman remains still existing shew, was the place now known as Caerleon-on-the-Usk, a village about three miles from Newport; which then became, by virtue of its military importance, the capital of the new province added to the Roman Empire by the victories of Frontius, and styled *Britannia secunda.* The boundary between Britannia Prima, and this new territory, was the Severn; and Gloucester, with its bridge at Over, the immediate key to it.

We do not learn from history that Frontinus made roads at all; but we are told that he was one of the most skilful engineers of his time; and just at that time, the custom of making *paved* roads reached its highest development. We are also told in an itinerary of distances from the various stations in Britain, which seems to date back to some time in the following century, that *Isca Silurum* (Caerleon) was a station on the *Via Julia.* Camden concludes, from this name being given to a road in the country conquered by *Juliuis* Frontinus, that it was most likely made by, and named after, that general. However that may be, it may suffice to say that the *Via Julia* is generally represented in Roman maps as crossing the Severn at Aust, and to have no link between Chepstow and Gloucester. That there was a road from Bath to Aust, is unquestionable, but for the same reason that it existed, there must have been one from Gloucester to Caerleon. That reason was, the necessity for the rapid transit of troops, both horse and foot, in case of attack on the garrison of the second Legion, planted in an isolated colony in the heart of the enemies' country. Common sense seems to point out, that if the Romans had two large military centres within a day's ride of each other, they must have a road to connect them. Yet, by a strange oversight, no map of Roman roads which has been published in this country, gives any track connecting Gloucester with Chepstow, Caerwent and Caerleon.

A German savant, however, Dr. Hübner, who has collected with giant labour *all the Roman Inscriptions which have been* *found in the world,* gives in his volume on Britain, a map in which he dots this very line of road, as one which *must have existed.* Had Dr. Hübner lived in Gloucestershire instead of Berlin, the whole system of Roman roads in our county would long ago have been clearly laid down; at all events his surmise is verified in the case of the *Via Julia,* which runs from Over Bridge along part of what is now the turnpike road to Newnham. At Westbury, it turns to the right and proceeds to Little Dean, whence it follows the beautiful valleys formed by the double line of hills of Old Red Sandstone, in the direction of Lydney. There are other Roman roads in the Forest of Dean; some possibly made for the more easy conveyance of timber and iron ore; but this main line, running as it does outside the limestone district, and, therefore, outside the line of the iron mines, must be regarded as a purely military one. And what is the *Via Julia* now? a rough cart-road, full of hollows and deep ruts, and great displaced blocks of stone; in some places not a stone is left, in others, for several yards, not a stone is wanting. Where it remains perfect it consists of roughly-squared blocks of conglomerate or of mill-stone grit, of ten inches to a foot cube each, with a well-set line of marginal stones, about fifteen inches long by five inches wide and ten inches deep. These bordering stones, which are of hard Forest rock, are again supported by a buttress-line of large blocks outside, and set a few inches below the level, serving probably also as a gutter to prevent washing away of the substratum.

The average width of the road-way, is eight Roman feet; that is, rather less than eight English feet. The strength of the work is such, that after the lapse of all these centuries, but for the use that has been made of it as a quarry for roads, fences, and buildings, it would have been in good order still. Is it too much to ask that means should be taken to preserve, if but one little piece of, this venerable causeway? A piece railed off ten yards long would suffice; and before very long, if we don't secure this, it will be too late.

I should not be doing justice if I omitted to state, that it is to the industry and research of our colleague John Bellows, that we are indebted for the discovery of this portion of the *Via Julia*, and for the learned references which I have embodied in the foregoing remarks.

Leaving the *Via Julia* at Soudley, where there is a small triangular camp, which may have had some connection with it, the members made a hasty visit to the iron works, and examined some of the ores smelted there. Soudley has been for centuries the seat of iron manufacture. In 1550 or 1560 wire was made there drawn out by strength of hand. It is at present devoted to the production of "pig" only, of which some 25 tons are turned out daily when the furnaces are in full blast; and this quantity will before long be increased. The ores are of several sorts. Forest hæmatite, fine Spanish ore from Bilbao, and grey iron stone from Yorkshire. The mixture of these different sorts produces the particular quality known as "Soudley pig." It is not a little curious that while the Romans mined iron in Dean Forest to such an extent that their imperfectly smelted cinders have ever since furnished a source of wealth in the re-smelting, iron-mining had fallen to so low an ebb in the district a century ago, that every bit of ore smelted in the Forest was for some time brought from Lancashire.

While the party was occupied in the examination of these heaps, the foreman of the works brought an ancient ladder to shew them, which had been found in one of the old workings, quite recently. It was a single beam of Oak, 5 or 6 inches thick, and about 7 feet in length, with large notches cut in it to afford foot-hold to the miner, in reaching faces of rock a few feet above his own height.

The party returned by way of the Blaize Bailey to Newnham, where they dined together at the Victoria Hotel.

The Second Field Meeting of the season took place at

MALMESBURY,

on Thursday, 15th of June.

The rain, so earnestly desired by the farmers, did not contribute to the enjoyment of the members of the Cotteswold Club on this occasion.

A well appointed break with four horses, met the party at Stroud, from whence the drive through the beautiful valleys of Nailsworth and Avening was greatly enjoyed. A short halt was made at Whitecroft, the residence of Mr. G. F. PLAYNE, whose collection of Thorns (*Cratægus*) from all parts of the world, is a novel and interesting example of arboriculture. A pretty rivulet in the garden, draped with moss and sheltered by shrubs, had been made a nursery for every species of British fern, from the royal plumes of the '*Osmunda*' to the delicate fronds of the maiden-hair, which had evidently found a congenial habitat, and flourished luxuriantly.

Near Longford Mills a halt was made to examine a section of drifts described by Mr. WITCHELL in a paper on the "Angular Gravels of the Cotteswold," in the last part of the published 'Transactions' of the Club.

On the way to Tetbury, two quarries were examined, both in the Great Oolite; the first, on the hill above Avening; the other Bay's quarry near Tetbury; neither of which yielded anything deserving special notice. Luncheon was served at the White Hart, Tetbury, from whence a move was made to Beverstone Castle, which was visited by the Club in the month of August, 1871, and was made the subject of "Notes" by Mr. G. F. PLAYNE, embodied in the President's Address at page 16, of the 5th Volume of our Transactions. The Rev. T. H. BLUNT acted as guide to the party, to whom he pointed out the particulars most worthy of notice about the Castle, of which he has since become the historian.

From Beverstone the party drove to Malmesbury, the rain falling in a continuous downpour. The splendid remains of the Priory Church were thoroughly examined and admired from every point of view. A Section was examined on the new line of rail where the 'Forest Marble' is exposed with a capping of 'Cornbrash'; but the rain which fell inexorably compelled a hasty retreat to the George Hotel, where an excellent dinner was provided. After dinner, Mr. F. D. LONGE explained his views of the geology of the Cotteswolds, derived from a study of the sections on the line of railway between Cheltenham and Banbury.

The Rev. Dr. F. Smythe read a paper on the occurrence of *Plicatula lævigata* in the Middle Lias of Churchdown Hill. The discovery of this fossil is of importance as bearing on the correlation of the same beds in England and on the continent of Europe, where, as in Normandy and elsewhere, it has been found in abundance; while Dr. Smythe has been the first to identify it in this country.

The Third Field Meeting was held at

PURTON,

on Tuesday, 18th July.

The members assembled at Purton Station on the line of the Great Western Railway, where they were met by Major Prower, and proceeded in carriages to Purton Spa, about a mile distant, where they were met by Mr. Sadler, F.R.C.S., the proprietor of the Spa, who gave them much interesting information respecting its origin and uses. The spring appears to have been called "Salt's Hole," and is known to have been resorted to for the cure of diseases for more than 200 years.

The water issues from the earth at a uniform temperature of about 59°, and is charged with about 51 cubic inches of carbonic acid gas to the gallon, besides containing valuable salts of iodine and bromine, with sulphates of magnesia and soda, and carbonate of potass. Much of the water is used on the spot, and large quantities are bottled and sent to a distance.

From Purton Spring, the members of the Club proceeded to a quarry in the outskirts of the village, to examine a good section there presented in the Coralline Oolite, where a good list of fossils was obtained.

A move was then made to Ringsbury Camp, where the Club was met by the Rev. W. H. E. McKnight, who gave much interesting information on the nature and extent of these curious earthworks. Mr. McKnight gave it as his belief that Ringsbury Camp forms part of the vast system of defence which surrounds Avebury, and that the question of the age of

Ringsbury, can only be answered by getting some notion of that of Avebury. Mr. McKnight argued that 'Megalithic' monuments, scattered widely as they are over the earth's surface, and found in every nation in the world, were probably connected with sun worship; and that though the monuments had nothing about them that could serve the purposes of war, yet that they had very frequently round them, as at Avebury, real lines of defence, strong lines of such fortifications, as the people who raised them were acquainted with in those early ages of the world. Thus on the south side of Avebury runs the Wansdyke, and on the other side, extending down into the plain of Braden, the defences consist of a series of earthworks occupying admirable defensive positions. Along the north-eastern flank of the Downs from Avebury we have first, Barbary Castle (or Camp), and beyond that Siddington Castle, with the White Horse hill and castle on the extreme flank. To the front or north of Avebury, we have Ringsbury, and beyond this again, a smaller work still traceable at Bury Hill; and further eastwards the strong earthwork at Blunsdon; so that with the Wansdyke in the rear, and these works thrown out far to the front, and covering the country round the 'Downs,' there would be ample defence for the most sacred spot in all the island. The earthworks at Ringsbury enclose a large space of ground, and though in their origin as suggested by Mr. McKnight they may have had some connection with Avebury, there is no doubt that they mark the site of a very early British village, and have been occupied in succession by Roman and Anglo-Saxon.

Scattered over the surface of the Camp at Ringsbury were pieces of a sandstone rock of a very curious character differing entirely from any previously met with. I am indebted to the Rev. Dr. Smythe for the following notes upon it. He says:

'A story obtains amongst the people of the villages round, that the pieces of sandstone of light weight lying scattered over Ringsbury Camp, are pieces of pumice-stone that were brought thither by the ancient warriors, with which to furbish their armour and weapons.

This drab coloured sandstone seems to lie here and there in fragments within the enciente of the Camp, but appears in greater quantity, yet still in detached pieces, in the fields of the high ground near it. It in fact constitutes the uppermost layer, mixed with scanty alluvial soil, that forms the cultivated surface of the fields.

The sandstone belongs to the Upper Calcareous Grits and occurs only at intervals along this line of country. It consists of a white calcareous pisolite interspersed throughout a ferruginous sandstone; each particle of the pea-grit is coated with ferric oxide. Exposed as a surface bed, the rain with its Carbonic acid has dissolved out the lime; so that when tested with strong mineral acids, the rock does not effervesce; and thus it is left full of lenticular shaped cavities, each cyst being lined with a film of red oxide of iron, that has withstood the attacks of the Carbonic acid.

The specific gravity of the rock is but 2·056. When examined with a lens, the rock discloses two siliceous constituents. I regard it as a re-constituted rock—shortly explained as a marly siliceous sand, throughout which whilst still loose, a calcareous pea-grit has been scattered, prior to the chemical changes that removed the lime and left the iron. These chemical causes have produced a vesicular state, which plainly accounts for the slight density of the rock. The light weight of the stone drew the attention of the country folk to it, and fancy did the rest; and thus was created the myth of the ancient warriors and the pumice-stones of Ringsbury Camp."

From Ringsbury the party was conducted by Mr. McKnight to his pleasant residence at Lydiard Manor, where a supply of cooling drinks proved very welcome, for the heat of the day was great.

A short walk brought the party to the Church of Lydiard, which dates from 1424, and possesses a Norman font, probably belonging to an earlier Church on the same site.

Their next visit was to Purton Church, of late Perpendicular work, dating from about 1480. From thence they went to a field near the residence of Major Prower, where they were joined by Mrs. Prower and several ladies and gentlemen of the neighbourhood, and sat down to an excellent dinner provided for them by their hospitable entertainer.

After dinner several interesting matters were discussed, which the limits assignable to the records of this day's proceedings, will not permit me to debate upon. I am indebted to Dr. Smythe for the following list of fossils from the '*Perarmatus-zone*' of the Coralline Oolite of Purton.

- *Am. varicostatus*
  - *perarmatus*
- *Bel: abbreviatus*
- *Chemnitzia striata*
  - *Heddingtonensis*
- *Euomphalus helicoides* (Forbes)
- *Cerithium muricatum*
- *Neritopsis corallensis*
- *Lithodomus inclusus*
- *Nerinœa hieroglyphica*
- *Ostrea gregaria*
  - *solitaria*
- *Trigonia clavellata*
- *Thecosmilia annularis*
- *Thamnastrœa arachnoides*
- *Cidaris florigemma*
- *Acrosalenia decorata*
- and portions of other Coral Rag Urchins.
- *Spongia vagans*
- and others of the *Spongiadœ.*
- *Serpula runcinata*
- and innumerable fragments of '*Crinoidea*'

The Fourth and last Meeting of the Club for the Season, was appointed for

DUNDRY HILL, NEAR BRISTOL.

This remarkable outlier from the Cotteswold range, presents features so peculiar, as to form by itself a study of no mean importance to the geologist, in the correlation of distant beds not otherwise easy of interpretation. The difficulty of diagnosis is much increased by the absence of continuous sections, which is due to the fact, that, except at the summit of the hill, where the stone is quarried for building purposes, the only means of tracing the succession of the beds, is by the help of road cuttings and two small quarries, on opposite sides of the hill. A mere casual survey will not suffice to enable the explorer to comprehend the true succession of the beds without the help of one who has made a special study of the geology of the hill: such a guide the Cotteswold Club was so fortunate as to possess in Mr. STODDART, of Bristol, a gentleman thoroughly well skilled in the geology of the surrounding district.

Passing from Bristol, the hill of Dundry presents a bold front, crowned by the conspicuous tower of its Church,—a land-mark visible far away over the waters of the Bristol Channel. The road on leaving Bristol passes over the red marls of the Trias, rising gently to Bedminster Down, where the Rhœtic beds are exposed with their characteristic fossils, amongst which are enumerated '*Naiadites petiolata,*' '*Estheria minuta,*' '*Monotis decussata,*' '*Hybodus minor,*' '*Cythere liassica*' and the '*Insect-bed.*' The lower mass of the hill of Dundry is occupied by the beds of the lias, and it is not until near the summit that the Oolite is fallen in with.

The first section examined was in a road-side quarry, called the "Cross-roads" quarry, a small opening made by the way-side for road-stone. Here are exposed the beds known as the '*Humphresianus*"*-zone,* the counter part of which must be sought in the so-called "Rolling-stone" quarry on Cleeve Hill beyond Cheltenham. The beds here are about 27 feet thick, and in descending order are thus distinguished by Mr. STODDART:—

'Dimyaria' bed	13 feet
Ammonite bed	11 feet
Iron-shot bed with Gasteropods	3 feet

These beds abound in fossils, of which a characteristic collection was soon formed.

The next section visited was a quarry on the side of the hill looking towards Chew Magna, where are displayed the Upper Ragstones of the 'Parkinsoni'-zone (next above the beds last examined).

These beds which are traversed by a band of coral, proved very barren of fossils, a feature characteristic of all the beds of the Oolite at Dundry, above the zone of '*Ammonites humphresianus.*' In immediate succession to the 'Rags' of the 'Parkinsoni'-zone, and apparently a further development of the same, succeed the building-stones on the summit of the hill, where it is evident they have been quarried, from a very remote period, as is shewn by the mounds of turf-covered *debris* with which the surface of the ground is everywhere disturbed. These beds are marked by an utter absence of distinctive fossils, and present a feature which has no apparent representative elsewhere in the Cotteswolds. They would seem to be the equivalent of the 'Clypeus Grits' of Leckhampton hill, but the absence of fossils makes it difficult to correlate them exactly. These uppermost beds are about 17 feet in thickness.

The Church tower is of singular beauty, and is happily beyond the reach of the restorer, who has polished and modernized the interior. It was ascended by several of the party, who enjoyed greatly the magnificent prospect from the summit, together with a deliciously cool breeze, which at that elevation tempered the flaming ardours of the afternoon sun.

The party dined together at the Royal Hotel Bristol, in company with their guests, W. W. Stoddart, Esq., F.G.S., and Dr. Burder, Vice-Presidents of the Bristol Naturalists' Society, and A. Leipner, Esq., the Hon. Secretary.

After dinner Mr. G. F. Playne made some remarks upon certain subsidences of the ground known as "Whorley Pitts," in the parish of Avening. These pits he described as varying in size from a few inches in width and depth, to several feet, insomuch as to become in some cases a source of danger. These subsidences he found were caused by water washing out the softer strata below; but it did not seem to be shewn why these sinkings should assume always a more or less circular form. It appeared from the discussion which followed, that like subsidences are known to occur in the Carboniferous Limestone, and one such was mentioned as existing on Clifton Down.

I am indebted to Mr. Stoddart for the following list of fossils from the Dundry Oolite. It is by far the most complete catalogue which has yet been published, and may well supply a model on which some amongst us may prepare, what has been long needed—a tabulated list of all the fossil shells found in the Gloucestershire Oolites. In the first volume of our Transactions, at page 62, will be found a "Tabular view of

Fossil Shells from the Middle Division of the Inferior Oolite in Gloucestershire, by JOHN LYCETT." This list, for reasons given by the author, is limited to a special horizon, and that confessedly the least fossiliferous. He refers to the labours of Messrs. BUCKMAN, STRICKLAND, and BRODIE amongst the Cotteswold Oolites; and since their time many partial lists illustrative of special zones have been published; but it yet remains to some careful and competent hand to produce that which would be of vast assistance, in the way of comparison, to searchers in other localities, viz.,—a good and complete catalogue of the fossil shells of the Inferior Oolites of Gloucestershire. I recommend this earnestly to the attention of the geologists of the Cotteswold Club.

List of the Characteristic Fossils of the Dundry Oolite, by W. W. STODDART.

IRON-SHOT BED.
(3 feet)

Purpurina Bellona	(D'Orb)	Monodonta lævigata	(Sow)
〃 Inflata	(Tawney)	〃 Acmon	(D'Orb)
Euspira Bajorensis	(D'Orb)	Straparollus Dundriensis	(Tawney)
〃 Zelima	(〃)	Cirrus nodosus	(Sow)
〃 Dundriensis	(Tawney)	〃 pyramidalis	(Tawney)
〃 Canalienlata	(Lyc.)	Pleurotomaria elongata	(Sow)
Chemitzia lineata	(Sow)	〃 punctata	(〃)
〃 procera	(Desl)	〃 Sandersii	(Tawney)
〃 Heddingtonensis	(Sow)	〃 Agatha	(D'Orb)
Nerinea bacillus	(D'Orb)	〃 Bessina	(〃)
〃 funiculus	(Desl)	〃 Amyntus	(〃)
Melania undulata	(〃)	〃 Allica	(〃)
Alaria myurus	(〃)	〃 salcata	(Sow)
〃 Dundriensis	(Tawney)	〃 subdecorata	(Muln)
〃 trinitatis	(〃)	〃 Monticulus	(Desl)
〃 Perrieri	(Piette)	〃 obconica	(Tawney)
〃 Lorieri	(D'Orb)	〃 distinguenda	(〃)
〃 Etheridgii	(Tawney)	〃 Dundriensis	(〃)
〃 Lotharingica	(Schl)	〃 subreticulata	(D'Orb)
Littorina edulis	(Muln)	〃 granulata	(Sow)
〃 biarmata	(〃)	〃 Palæmon	(D'orb)
〃 recteplanata	(Tawney)	〃 pallium	(Morris)
Neritopsis Bajocensis	(D'Orb)	〃 actinomphala	(D'Orb)
Phasianella striata	(Sow)	〃 Actæa	(〃)
Amberleya princeps	(Ræm)	〃 armata	(Muln)
〃 ornata	(Sow)	〃 Stoddarti	(Tawney)
〃 goniata	(Desl)	〃 Sauzeana	(D'Orb)
Tasbo Stoddarti	(Tawney)	〃 fasciata	(Sow)
〃 Dundriensis	(〃)	〃 proteus	(Desl)
〃 Shaleri	(〃)	〃 Yeovillensis	(Tawney)
Trochus Sandersii	(Tawney)	〃 textilis	(Desl)
〃 Zetes	(D'Orb)	Trochotoma gradus	(Desl)
〃 Ibbetsoni	(M & L)	Pecten barbatus	(Sow)
〃 Winwoodii	(Tawney)	Opis lunulata	(Defr)

etc., etc.

CEPHALOPODA BED.

(11 feet)

Ammonites Braikenridgii	(Sow)
〃 Blagdeni	(〃)
〃 Brocchii	(〃)
〃 Humphriesianus	(〃)
〃 dimorphus	(D'Orb)
〃 lævius culus	
〃 Sowerbyi	(Mill)
〃 Dundriensis	(n.sh.)
〃 Eudesianus	(D'Orb)
〃 Brongniarti	(Sow)
〃 concavus	(〃)
Ammonites discoides	(Zieten)
〃 Murchisoni	(Sow)
〃 Complanatus	(〃)
Nautilus excavatus	(〃)
〃 lineatus	(〃)
〃 obesus	(〃)
Belemnites canaliculatus	(Schloth)
〃 ellipticus	(Mill)
〃 sulcatus	(〃)
〃 eccentricus	(Blainville)

and very few Bivalves.

DIMYARIA BED.

(13 feet)

Tevebratula globata	(Sow)
〃 perovulis	(〃)
〃 Phillipsii	(M & D)
〃 sphæroidalis	(Sow)
〃 submaxillata	(〃)
〃 Etheridgii	(Lyc)
Rhynchonella subtetraedra	(Dav)
〃 spinosa	(Schloth)
〃 plicatella	(Sow)
Ostrea flabelloides	(Lan)
〃 gregarea	(Sow)
Pecten barbatus	(〃)
〃 lens	(〃)
〃 fibrosus	(〃)
Lima duplicata	(〃)
〃 Etheridgii	(n.sh.)
〃 gibbosa	(Sow)
〃 pectiniformis	(Schloth)
Hinnites tuberculosus	(Goldf)
Gervillia Hartmanni	(〃)
〃 pernoides	(Desl)
Pinna cuneata	(Phill)
Trichites nodosus	(Lyc)
Modiola plicata	(Sow)
Lithodomus	(sp.?)
Arca quadrisulcata	(Sow)
〃 elongata	(〃)
Cucullæa oblonga	(Sow)
〃 cucullata	(Goldf)
〃 elegans	(Sow)
〃 reticulata	(Phill)
〃 cancellata	(〃)
Macrodon Hirsonensis	(L & M)
Trigonia striata	(Sow)
〃 costata	(〃)
〃 clavellata	(〃)
Cardium Buckmanni	(L & M)
〃 striatulum	(Sow)
〃 incertum	(Phill)
Lucina Bellona	(D'Orb)
Sphæra Madridi	(D'Arch)
Unicardium depressum	(Phill)
〃 gibbosum	(Lyc)
Tancredia donaciformis, very rare	(〃)
Astarte excavata	(Sow)
〃 lurida	(Phill)
〃 obliqua	(Desl)
〃 subtrigona	(Münst)
〃 ovata	(Sow)
〃 orbicularis	(〃)
〃 elegans	(〃)
〃 rhomboidalis	(Goldf)
〃 tetragona	

DIMYARIA BED,

continued.

Astarte Voltzii	
Cypricardia cordiformis	(Desl)
Cardinia crassissima	(Stutch)
〃 concinua	(〃)
Isocardia cordata	(Buckm)
〃 rostrata	(Sow)
〃 tener	(〃)
Myoconcha crassa	(〃)
rhombea	(〃)
Homomya crassiuscula	(Lyc)
Opis lunulatus	(Dep)
〃 similis	(〃)
〃 trigonalis	(〃)
Ceromya striata	(Ag)
〃 Bajociense	(D'Orb)
〃 concentrica	(Sow)
Gresslya abducta	(Ag)
〃 unioides	(〃)
Myopsis Jurassi	(Brown)
Pleuromya donacina	(Ag)
Myacites teruistriata	(〃)
〃 oblonga	(Brown)
Pholadomya angustata	(Sow)
〃 obtusa	(〃)

Pholadomya ovulum	(Ag)
〃 Heraulti	
〃 acuticostata	(Sow)
〃 fidicula	(〃)
Goniomya angulifera	(〃)
〃 V scripta	(〃)
Glyphea rostrata	
Zoophycus scoparius	(Heer)
Thamnastrea fungiformis	(E & H)
Stomechinus germinans	(Phill)
〃 intermedius	(Wright)
〃 bigranularis	(Lam)
Psudo diadema depressum	(Ag)
Magnotia Forbesii	(Wright)
Holectypus depressus	(Leske)
Hemicidaris granulosa	(Wright)
Hemipedima Bakeri	(〃)
Collyrites ovalis	(Leske)
〃 ringens	(Ag)
Hyboclypus caudatus	(Wright)
〃 agariciformis	(Forbes)
Cidaris Bonchardii	(Wright)
Serpula limax	(Goldf)
〃 quadrilatera	(〃)

etc., etc.

RAGSTONE BED.

(8 feet)

Ammonites Parkinsoni	(Sow)
〃 læviusculus	(〃)
(many named in Worsley's MSS.)	
Belemnites ellipticus	(Mill)
Pleuromya elongata (Myacites, Goldfussi, Morris)	
Pholadomya ovulum	(Ag)
〃 fidicula	(Sow)
Gervillia Hartmanni	(Goldf)
Rhynchonella spinosa	(Schl)
〃 plicatella	(Sow)
Magnotia Forbesii	(Wright)
Stomachinus intermedius	(〃)
Echinobrissus clunicularis	(Lloyd)

Holectypus depressus	(Leske)
Axosmilia Wrightii	(E & H)
Isastrea explanatula	(M'Coy)
〃 helianthella	(〃)
〃 Richardsoni	(Eda)
〃 tenuistriata	(M'Coy)
Montlivaltia cupuliformis	(Wright)
〃 Delabechii	(〃)
Thamnastrea Defrancii	(Urich)
〃 fungiformis	(E & H)
Thecosmilia gregaria	(M'Coy)
Latomeandra Flemingii	(E & H)
Anabacia hemispherica	(Edw)
〃 orbitulites	(Lam)

etc., etc.

FREESTONE BEDS.

(17 feet)

Pentacrinus Milleri	(Austin)	Stylina solida	(M'Coy)
Isastrea explanatula	(M'Coy)	Thamnastrea Defranciana	(Mich)
〃 hilianthella	(〃)	Latomeandra Flemingii	(E & H)
〃 tenuistriata	(〃)	Heteropora ramosa	(M'Coy)

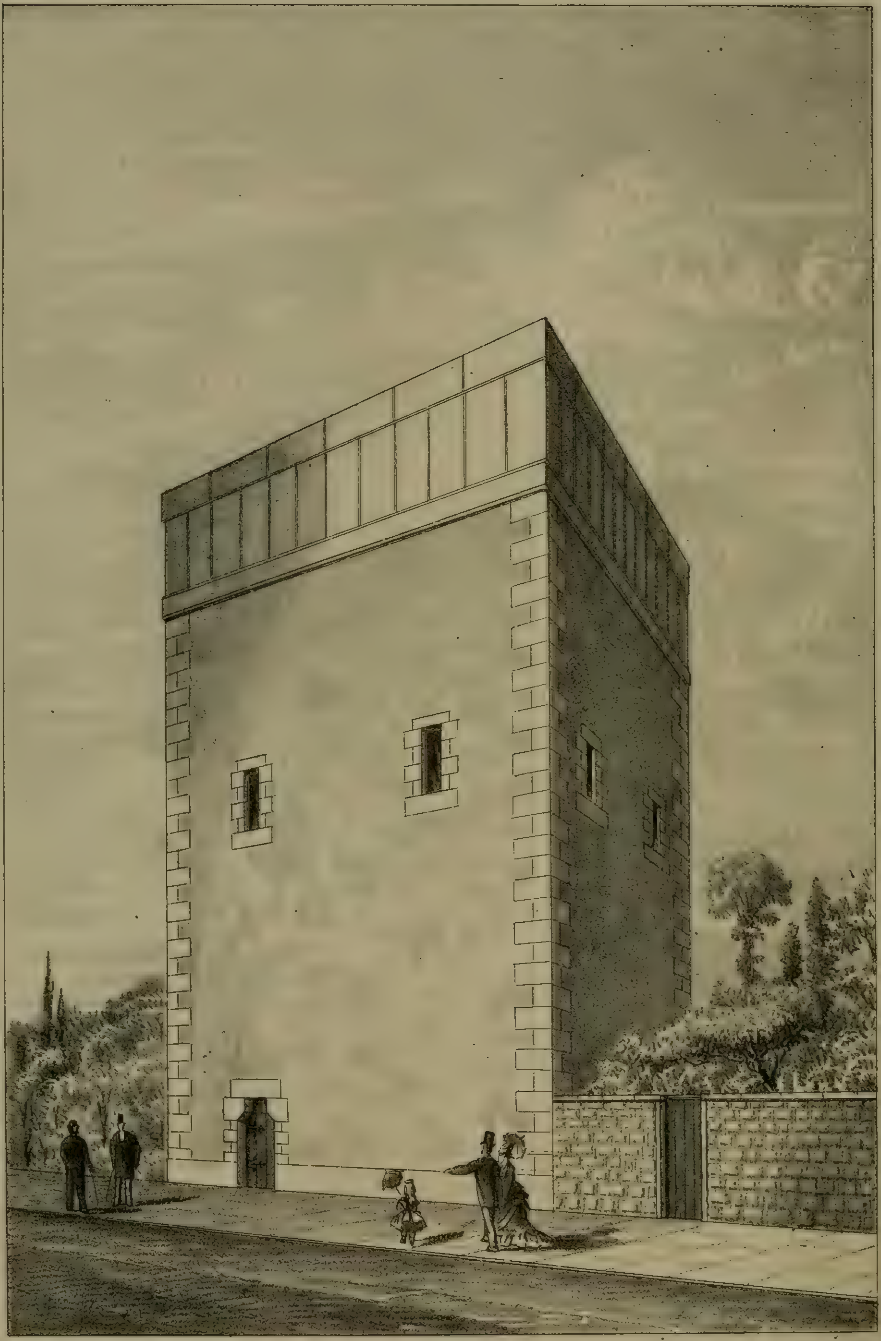
(N.B.) Very few fossils to be found perfect in these beds. Most of them being in a very broken condition.

FISHES FOUND IN THE DUNDRY BEDS.

Pycnodus Bucklandi	(Ag)
Strophodus magnus	(〃)
〃 subreticulatus	(〃)
〃 tenuis	(〃)

In the Dundry Beds have been noticed more than 90 genera and 300 species.

MALMESBURY WATER TOWER & TANK.



Description of the Malmesbury Water Works, with remarks on the Flow of Streams in the Cotteswold District, by

JOHN H. TAUNTON, M. Inst. C.E., F.G.S.

There may be some circumstances associated with the Water service to the town of Malmesbury that will prove interesting to the Cotteswold Club.

The works were commenced towards the end of 1864.

A manifest and apparently safe source of supply existed in the Water Bearing Strata, found in or under the Forest Marble, which develop the springs (of an Artesian character) that rise in the Abbey meadows, below the town, constituting Feeders of the river Avon.

It was proposed to obtain this subterranean supply in the manner indicated on the plan and section, the works being carried on progressively, according to the quantity of water needed—about 40 gallons per minute being aimed at in the first instance.

A length of 178 yards of Collecting Conduit, passing from the Pump House at the foot of the Hollow-way, under the river Avon to a well in the meadows on the north side of the river, was put under contract on September 22nd, 1864, when the contractor commenced operations. The excavations for the Trench, between the Pump House and the river, were in Oolitic gravel, found immediately below the surface soil and for a depth of 12 to 15 feet down. This gravel was charged with water, clear, bright, and apparently pure and unexceptionable in quality, resembling, it was thought, the spring water of which the following satisfactory analysis, by Dr. Voelcker, had been previously obtained.

An imperial gallon contains 25·01 grains of solid matter, consisting of:—

Organic Matter	1·60
Oxides of Iron and Alumina, and traces of Phosphoric Acid	·10
Carbonate of Lime	17·23
Sulphate of Lime	2·69
Magnesia	·74
Chloride of Sodium	1·98
Carbonate of Potash and Soda	·67
Silica	trace
	25·01

Degree of hardness, according to Dr. Clarke's scale, 21°.

It is a remarkable bright and nice tasting water, and, in my opinion, perfectly wholesome and useful for all domestic purposes. You will notice that it hardly contains any soluble Organic matter—indeed it may be said to be practically free from injurious Organic impurities.

The prevailing constituent is Carbonate of Lime, which, of course, renders the water somewhat hard, and not so good for cooking as soft waters. But, on the other hand, it is a remarkably wholesome water, not excessively hard, and, moreover, deposits the greater part of its lime on boiling, and, when wanted for washing or the feeding of steam boilers, may be easily softened by Clarke's patent lime process.

Altogether I have a very favourable opinion of the general good and wholesome character of this water.

It certainly cannot be called soft, but there is even some advantage in this, for waters that are somewhat hard do not attack lead so readily as any soft waters.

I have no doubt it will be found an excellent drinking water.

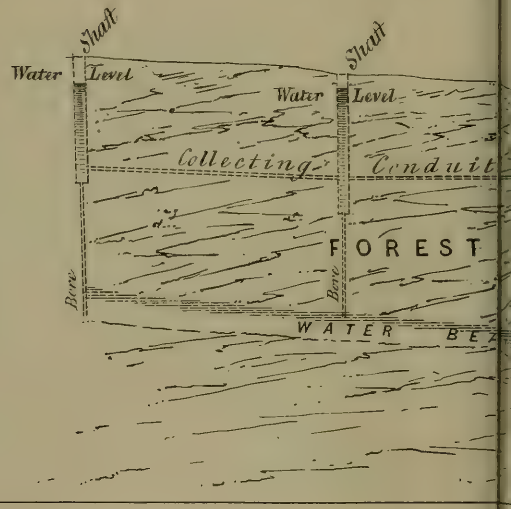
(Signed) Augustus Voelcker.

16th July, 1863.

The contractor, a working man of the neighbourhood, found the pumping required for the insertion of the collecting conduit so much in excess of his anticipations, that he discontinued his operations, giving up the contract before reaching the river.

MALMESBURY

Section of C

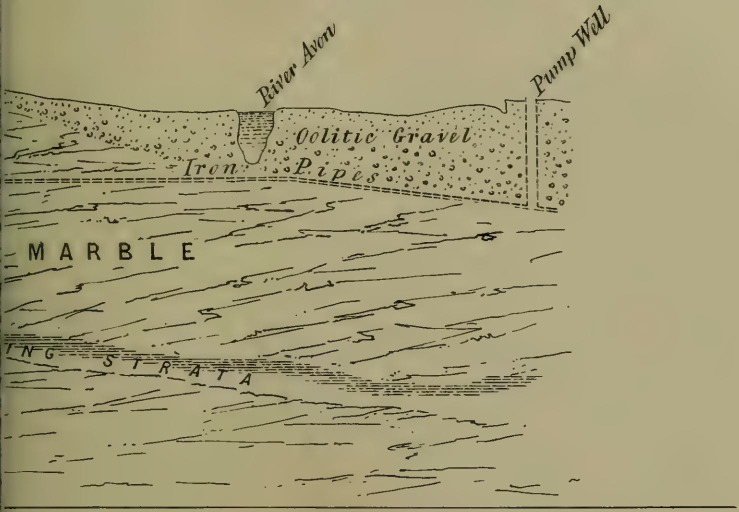


Horizonta

Vertical

WATER WORKS

ting Conduit.



Scales:-

- 2 Chains to an Inch.

20 Feet to an Inch.

As enough water had however been procured in the gravel, the Directors of the Company did not press him, but proceeded with the rest of their works, leaving the extension of the collecting conduit in the meadows, if it should be necessary, until the steam pump which was to lift the water for the service of the town, could be also made available for relieving the trenches in the low grounds from water.

The engine to serve the town is nominally 6 H.P., with 8 H.P. boiler, with triple pumps, the whole capable of lifting 60,000 galls. 100 feet in the working day.

The pumps raise the water through a 7-inch pumping main into a cast-iron high service tank placed on the water tower. This tank is 28 feet by 28 feet, and 6 feet 6 inches deep, containing about 30,000 galls.

The water tower was admirably constructed, principally in the winter of 1864, by MR. ISAAC GARDINER, the mason, of Brimscombe. The foundation for it proved a bad one, the site having formerly been a portion of the burying ground attached to the Abbey and Monastery. Though there were many cavities to fill in with concrete, and much care was necessary to obtain uniformity of bearing, the weight on the foundation being about 1½ tons per square foot, not a crack or settlement exists in the building.

From the tank, mains and service pipes distribute the water to the various streets and houses for sanitary and domestic purposes. The works were brought into operation in May, 1865, when it was found that there was some injurious infiltration at the gravel bed to the collecting conduit. Although it did not appear by chemical analysis that the water was otherwise than suitable for culinary and drinking purposes, still it was occasionally not bright, and contained 0·13 grains per gallon of Carbonate of Iron. One eminent chemist characterized it as a decidedly Chalybeate water, which another entirely denied to be a suitable description of it. The Directors under the circumstances judiciously decided to exclude altogether the gravel bed water, substituting iron for stoneware pipes in that portion of the conduit which passed through the gravel. They thus obtained a supply from the Bore Holes at the shafts only. This having been done, the water served was, and continues to be, the purest spring water of the character first analyzed by Dr. Voelcker.*

The overflow of the springs into the river shewn on the section is an interesting feature of this case, (and has indeed caused me to occupy your attention with this paper), as affording an instance of what may be said to be characteristic in the hydrology of the Cotteswolds. The waters in the Catchment basin of the Avon above Malmesbury, where they traverse the

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* The following letter from Mr. J. C. S. Jennings, the Chairman of the Malmesbury Water Works Company, has lately been published :—

MALMESBURY WATER WORKS.

To the Editor of the Wilts and Gloucester Standard.

Sir,—It may be interesting to the public to know that the Malmesbury Water Works Company, Limited, having found it necessary within the last few years to extend their works by sinking another shaft into the deep Oolite, to obtain a further supply of spring water, have recently had the water obtained from the shaft in the engine house, from which it is pumped direct to the tank (thus supplying the tops of all the houses in the town if required) analyzed, and that the following is the result of the analysis :—

	per gallon.
Total Solids	24·5 grains
Ammonia	0·0
Albuminoid Ammonia	0·0075
Chlorine	1·47
Nitrates	0·00
Nitrites	0·00
Hardness	19 Clarke
Permanent Hardness	7·75

A first-rate water in every respect.

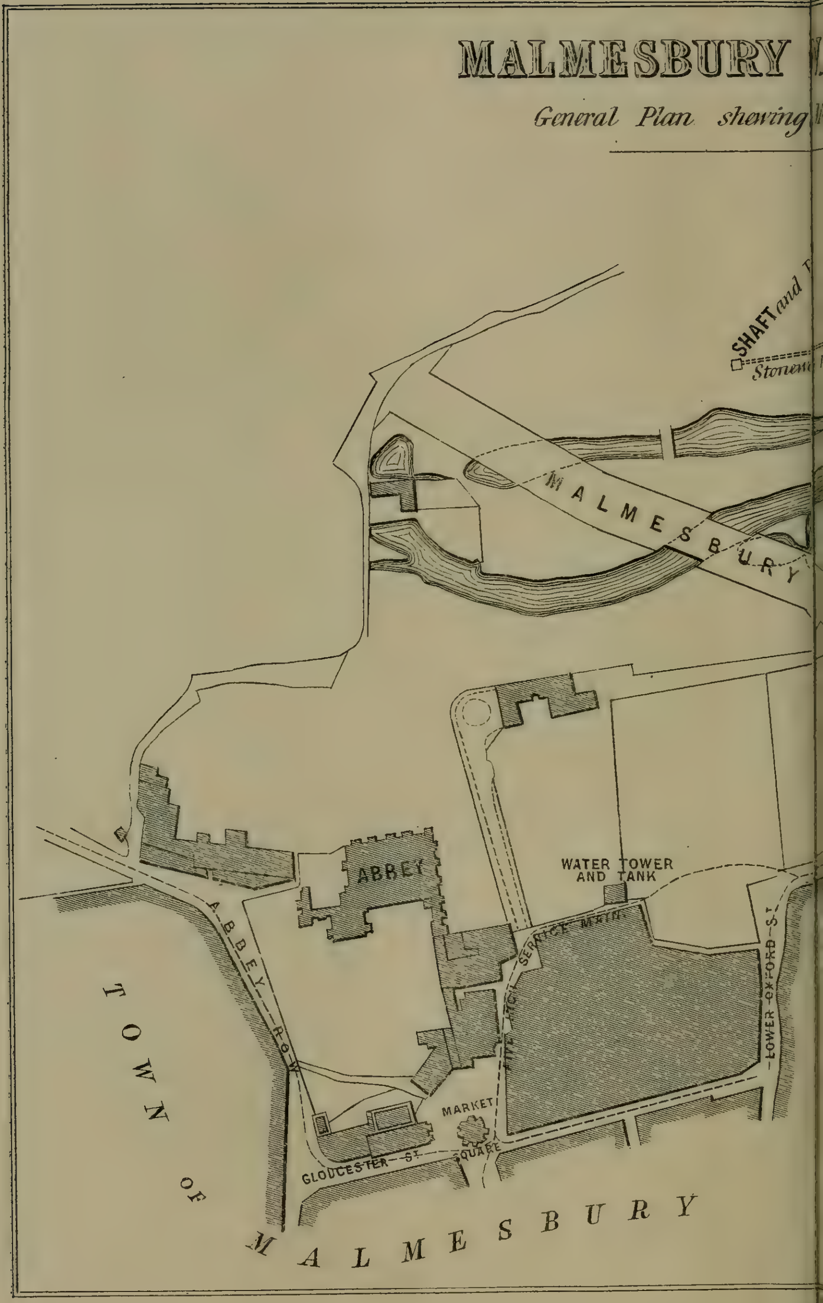
(Signed) Charles Heisch, F.C.S., late Professor of Chemistry in the Medical College of Middlesex Hospital; Superintending Gas Examiner to the Corporation of the City of London.

July 10, 1876.

This analysis corresponds very closely with that made by Professor Voelcker, in July, 1863, to which report he then added:—"It is a remarkably wholesome water, and not excessively hard, and there is an advantage in waters that are somewhat hard, that they do not attack lead so readily as very soft waters. I have no doubt it will be found an excellent drinking water."

I am, Sir, yours faithfully,

J. C. S. JENNINGS.

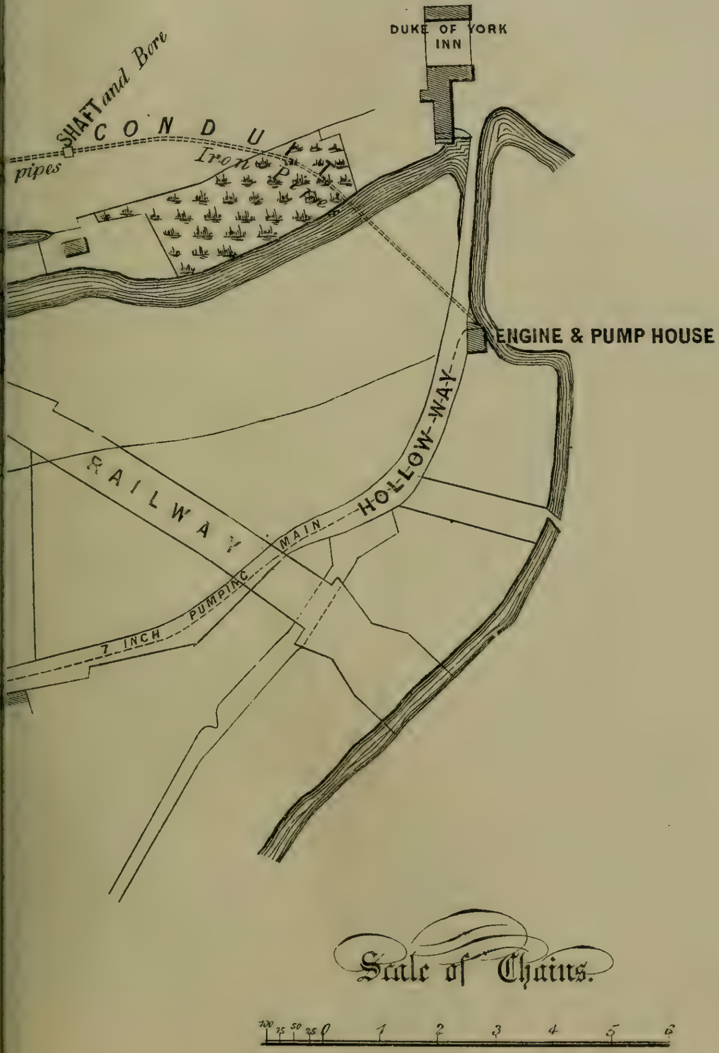


MALMESBURY

General Plan shewing

ATER WORKS,

ain Works of Supply:



NATURAL HISTORY

porous rocks of the Great Oolite, lose much of their surface character as developed by the Fuller's Earth, and pass down by percolation out of sight into absorbent beds in the Great Oolite. As the fall of the river is less than the mesne dip of these beds, they thus get under the impervious clays and rocks of the Forest Marble (as at the low grounds at Malmesbury), by which they are imprisoned until they find a fault in the stratigraphic uniformity, up which they ascend as Artesian springs, overflowing into the surface channels, and again restored to sight.

A similar peculiarity is remarkable in the river Churn, and in a greater degree. That river, after passing impervious beds of the Upper Lias for nearly 6 miles from its source, (at Seven Wells) attains a volume of 300 to 400 cubic feet per minute at Marisden Farm, whilst 6 miles lower down, after traversing the porous beds and fractured freestones of the Inferior and Great Oolites, on approaching Cirencester the volume becomes diminished to 30 cubic feet per minute only, showing a loss of 320 cubic feet, or 2,000 gallons per minute.

That the water is still under the valley has been demonstrated by the Barton boring, carried out in 1872 at the expense of LORD BATHURST, for I found and tapped it 91 feet below the surface, to which it forcibly ascended through the bore and overflowed. I do not, however, propose on this occasion to enter on the large subject of the hydrology of our Cotteswolds, on which I hope one day to be able to put together the notes that I have been making for some years past; but I take this opportunity of calling the attention of the Club to the important characteristic in the development of the streams of the district, particularly of those flowing towards the Thames and the Avon, to which I have referred.

It is probable that the views urged by our esteemed colleague, MR. WITCHELL, in his interesting paper on the Denudation of the Cotteswolds, as to the Formation of the Valleys being "the result of subærial denudation including springs and rivers in combination with landslips," may receive some modification from a consideration of the "*Circumstances of Flow*" of the denuding waters, for if their action is intermittent—subærial at one time, subterranean at another—there is somewhat of a break in that continuity which should be represented by corresponding changes in the appearance and physical conformation of the Combes and Valleys. Then as to the slips which are local and exceptional, their tendency is to move only to the extent necessary to obtain repose. This is exhibited in a general way on the hill sides where they occur by an accumulation of *reconstituted ground* in a condition of rest. The slips from the Fuller's Earth obtaining in their descent suitable under-drainage in the loose rocks of the Inferior Oolite, with a sufficient slope to stand, becoming arrested. The important subject of the carriage of Earthy Matter by the springs, is referred to in a practical manner in Mr. Witchell's paper, and he shows that about 200 tons of such solid matter is annually removed in apparently clear water from every square mile of the Cotteswold country, a circumstance that *may*, and indeed *must* have an influence on the general physical structure of the district, although its specific operation in the Formation of Valleys or Combes is not made evident.

Notes preliminary to a proposed Flora of Gloucestershire, communicated to the Annual Meeting of the Cotteswold Naturalist's Field Club, 1877, *by*

G. S. Boulger, F.L.S., F.G.S.,
Scientific Club, Savile Row, W.

It is strange that a large and important county such as this, the home of one of the oldest field-clubs in the kingdom, and of many competent naturalists, should never have obtained a county Flora. True, there are Floras of Bristol and of Cheltenham, one of Clifton in preparation, and allusions to Gloucestershire localities in Floras of Worcestershire, Oxfordshire and Bath; yet I venture to think the county as a whole worthy of a Flora of its own.

The most obvious objection to this, as to all other county Floras, is the artificial, arbitrary character of our county-boundaries. England may be naturally divided into five or six botanical provinces; but these to be properly worked must be sub-divided, and here no system is available, the river-drainage basins being too large. We therefore fall back on the civil divisions—the counties.

Even if a permanent resident in Gloucestershire, I could not, single-handed, undertake to work up the Flora of so large an area. One of my chief objects then in bringing forward these preliminary notes is to obtain assistance in the work and to sketch my proposed 'modus operandi.'

I propose to take Messrs. Trimen and Dyer's Flora of Middlesex as my general model, since it is, in my humble opinion, by far the most truly scientific local Flora we possess. I propose, however, a few important modifications. Interesting as they may be, no general essays on plant-distribution, or such subjects are in place in a local Flora, not forming part of a more comprehensive work. A sketch of the physiography of the county, *i.e.* its geology, physical geography and hydrography, is, on the other hand essential, and, perhaps, under the first of these sub-sections, some account of our fossil Flora would be not amiss.

In the preface to his excellent Student's Flora of the British Isles, Dr. HOOKER mentions his intention to have added to it, notes on the physiology and morphology of the several plants, and this we should, I think, endeavour to carry out for our, fortunately for us, far more limited area. Under this head I may mention the ideal of a Flora, sketched by the great German observer, Dr. HERMANN MÜLLER, of Lippstadt, in his "Befruchtung der Blumen durch Insekten." It ought, he says, not only to give the characters for the systematic discrimination of plants, but to help us to the causal conditions of these characters, by noting the insects which visit the flowers, the distribution of the plants, the variations of some species and so forth. We, possessing Dr. HOOKER's Flora and Mr. H. C. WATSON's 'Cybele Britannica,' need not repeat the ordinary technical characters or the general distribution of the species. I propose, however, to number the species, according to the London Catalogue; to give, like Messrs. TRIMEN and DYER, references to the 'Cybele Britannica,' with frequent quotations; to state as thoroughly as possible the distribution of species within the county, mentioning always, if possible, the nature of the soil, not of the sub-soil; and finally to add short notes, on insects visiting the flowers or feeding on the plant, on variations, physiology &c., such as are not accessible in ordinary text-books.

Such being my general plan, I must next inform you what I have done towards its fulfilment. The Flora must contain a county map, giving the surface—or soil—geology, the elevations, rivers and streams and names of villages, &c. Roads need not be given, though they might aid the mere collector. I will not trouble you with the details of the sketch of the physiography of the county, which I have prepared, since it is a subject familiar to most of us, and I hope to have the personal aid of some of our more eminent geological members in perfecting it. Still I may remark that the county divides itself naturally into four geological areas; viz., (1) The trans-sabrine, or Western Palæozoic region of the Forest, (2) The Cis-sabrine, or Lower Secondary region of the Vale of Gloucester, southward to Tortworth and Wickwar, which is chiefly Liassic. (3) The Bristol Coalfield, or Southern Palæozoic region, and (4) The Eastern, Cotteswold, or Oolite region. These regions do not readily admit of geological sub-division; they are too large to be taken as the ultimate botannical divisions; and the occurrence of outliers and of masking masses of drift render them unsuited scientifically for this purpose.

It has been found that distinct Floras often characterise neighbouring river-drainage areas. Nor can we wonder at this being the case, when we consider how readily plants can disseminate themselves along the banks of a stream, or be carried by the current, by floods or tide, and remember that probably our smaller streams even have flowed along the same course for at least 100,000 years. Taking then a hydrographic basis for our division, we can, I find, readily divide our 1,250 square miles of area into twelve districts. The watershed between the Thames and the Severn, part of the axial watershed of Great Britain, gives us our first great boundary-line; nine districts lie west, and three east of it. Of the nine westerly districts, three lie west of the Severn, one of them draining into the Wye. The southern-most of the remaining six drains immediately chiefly into the Bristol Avon and the northern-most into the Stour and Warwickshire Avon.

The districts are these:—

I. The Chipping Camden, or Upper Warwickshire Avon and Stour drainage-area, including all that part of the county lying north of a line from the apex of the Broadway re-entering angle, through Moreton-in-the-Marsh to the apex of a neighbouring Warwickshire re-entering angle.

II. The Cheltenham, Tewkesbury and Winchcomb, or Chelt and Lower Avon drainage-area, bounded by the county-boundary, the Severn from Apperley to Sandhurst, the Cotteswold escarpment from Snowshill to Seven Springs and by a somewhat dubious boundary of the Chelt drainage from Seven Springs to Sandhurst.

III. The Newnham and Newent, or West Severn district, including all that part of the county west of the Severn, and north of a line running along the Old Red Sandstone Ridge, from between Longhope and Ross to Blaize Bailey, and along the Triassic boundary-line between Newnham and Blakeney, to the Severn near Oaklands Park. This district includes nearly all the Trias in the county, districts I and II being mainly Lias.

IV. The Vale of Gloucester district, bounded by the Severn from Sandhurst to Purton Passage, by the Cotteswold escarpment from Seven Springs to Randwick, an arbitrary line thence to Rodborough Castle, the escarpment hence to Nympsfield, Rendcombe and Stinchcombe Hill and thence along the boundary-line of the Lias and Silurian to the Severn. This district is also mainly Lias.

V. The Vale of Berkeley district, lying south of the last and drained chiefly by the Little or Tortworth Avon. The escarpment forms the boundary from Rendcombe by Kingscote Park, Lasborough, Boxwell, along the high road to Oldbury-on-the-Hill, Hawkesbury and Horton, and then a line passing south-west of Wickwar, north of Tytherington, about half-a-mile north of Alveston to the Severn at Littleton—a line keeping on high ground, mostly, I believe, Millstone Grit and Mountain Limestone—completes the boundary.

VI. The Forest of Dean district, bounded by III from the Severn to Cinderford, and thence along the highest ground—here again Carboniferous Limestone or Millstone Grit—to Clement's End, east of St. Briavels, Hewelsfield, Lancaut and the Severn just below Sedbury Park. In this district the Liassic peninsula of Awre and a little Trias near Sedbury (? Rhœtic) are the only portions not Palæozoic, so perhaps it would be advisable to include the former in district III and the latter in district VII.

VII. The East Wye district, bounded by the county boundary from the border of III to Monmouth, hence by the Wye and on the east by VI, being mostly Mountain Limestone and Old Red Sandstone.

VIII. The Bristol district, bounded by V, the Severn, the county-boundary, and a straight line about a mile in length from the north of Badminton Park to the nearest point of the boundary of V, on the high road west of Oldbury. The geology of this district is most complex.

IX. The Stroud district, bounded by IV, V, VIII, the county-boundary from Didmarton to some two miles beyond Tetbury, west of Astley, and thence by a line, over high ground along the road from Down Farm, west of Rodmarton, to Sapperton Railway-Tunnel, the south-west corner of Sapperton Park, Winston, Sidebottom, along the Ermine Way to Stockwell and hence to the Seven Springs. This plateau drains chiefly into the Stroud-water.

X. The Cirencester, or Churn and Upper Thames district, bounded by IX, Wiltshire to near Maiseyhampton, and hence by a line through Barnsley, Foss Cross, Chedworth, and Foxcote to the border of II at Dowdeswell. In this district I include the outlying parish of Minety, which is surrounded by Wiltshire.

XI. The Fairford and Northleach or Coln and Leach district, bounded by X, the county-boundary to about four miles west by south of Burford, and thence by a line through Farmington, just north of Hampnet and south of Hasleton, to the borders of II between Sevenhampton and Charlton Abbots.

XII. The Stow, or Windrush and Evenlode district, bounded by I, II, XI and the county-boundary.

In district I are included the outlying parishes of Shenning-ton and Sutton, surrounded by Warwickshire.

I have discussed these districts in detail because I attach considerable importance to them. I want at least one collector in each district, and hope by giving the frequency of each species in each district, to arrive at conclusions of value as to the distribution of plants generally. In districts II and VIII much material is available, and I have got a small list of my own from district X, with these exceptions nearly everything is yet to be done.

I will myself willingly undertake the general editing and responsibility, the examination of metropolitan and other herbaria, the determination of all critical forms and the physiological notes. I have procured, for the use of any friends who will assist me, interleaved copies of the 7th edition of the London Catalogue of British Plants—one for each district, though more can easily be obtained if taken up—and the species here named, can nearly all be determined from Dr. HOOKER's Student's Flora. I should wish each list confined to one district; several localities to be given for uncommon species, in each district; a note as to the frequency, *i.e.* number of localities, and abundance, *i.e.* number of plants of each species; of the nature of its habitat, whether (to use Mr WATSON's terms) it is 'pratal,' *i.e.* growing in rich, damp grass-lands or meadows, or '*pascual*,' in pastures and on grassy commons, less luxuriant than the preceding, or '*ericetal*,' on moors and heaths, or, '*uliginal*,' in swamps or boggy ground, such as that in which Drosera grows, or '*lacustral*,' plants either continually immersed in, or floating on, water, as Lemna and Nymphæa, or '*paludal*,' *i.e.* in marshy ground with their roots in water all the year round, or nearly so, as Alisma Plantago, or '*inundatal*,' *i.e.* in ground often dry in summer but submerged in the rainy season, as is the case with Ranunculus hirsutus, or '*viatical*,' by roadsides or on rubbish, as Lamium purpureum and Urtica, or '*agrestal*,' on cultivated ground, as Papaver or Scandix, or '*glareal*,' in dry, exposed situations chiefly on gravel or sand, or '*rupestral*,' on walls and rocks, as Saxifraga tridactylites, or '*septal*,' on hedge-banks or in hedge-rows, as Stellaria holostea, or '*sylvestral*,' in woods and shady places, as Paris quadrifolia and Convallaria majalis, or '*littoral*,' on the sea-shore, as Convolvulus Soldanella, Armeria, or Eryngium maritimum.

One word will also suffice to indicate the surface soil. Notes of visiting insects or physiology should be made in a separate note-book.

With these preliminary instructions and notes, I pass on to a cursory survey of the flowering plants and ferns, noticing rarities already known, desiderata, my own observations round Cirencester and other facts. WATSON's Cybele Britannica seldom notes the occurrence of plants in our county, but generally confines itself to mentioning the province of the Severn, so I shall speak of plants so mentioned as "in the Cybele."

Clematis Vitalba, a septal plant, on calcareous soil, in the Cybele, abundant and frequent in X.

Thalictrum minus and T. flavum in the Cybele.

Anemone Pulsatilla, in the Cybele, as local and pascual, on calcareous soil, at doubtful altitudes, Gloucestershire and Berks being its southern limit. It occurs abundantly on Barnsley Down in X and at Rodborough in IX.

Myosurus minimus, Ranunculus Lenormandi, circinatus, hederaceus, Flammula, Lingua, auricomus and acris are in the Cybele, the latter occurs chiefly by roadsides in X.

Ranunculus bulbosus is the commonest meadow species in X.

Caltha palustris abounds in the meadows of the Thames and Churn.

Aquilegia vulgaris, the Columbine, is apparently wild in Oakley Park.

Sinapis muralis is reported from Bungay near Bristol. Is this in the county and authentic?

Does the Yellow Waterlily (*Nuphar lutea*) occur in the county? I am informed by Mr. S. F. ELTON, of Cirencester, that it does, at Cricklade, Wilts.

Cardamine impatiens has been seen from Gloucestershire by Mr. WATSON. Query, from what part?

Arabis stricta only occurs near Bristol and Cheddar in Gloucestershire and Somerset.

Draba muralis according to the Cybele has its southern limit in Somerset and Stafford. Does it occur in Gloucester?

Thlaspi perfoliatum is our most interesting rarity. It is mentioned by HOOKER as occurring in "Limestone pastures, rare; Oxford and Gloucestershire; fl. April—May." I do not know whether Burford, in the former county, is the original

English locality, but I am not aware of its having been found there of late years. There are no specimens of it in Dr. S. P. Woodward's Herbarium (about 1845) in the Agricultural College, Cirencester; but I believe Professor Buckman found it by the roadside below Sapperton village. Here I looked for it in vain last spring (1876), perhaps on account of the opening of new roadside quarries. From Professor Thiselton Dyer's (1869) locality, 300 yards west of Tetbury Road Station however, I traced it to the top of the shorter railway-tunnel at Sapperton and eastwards nearly to Kemble—that is into Wiltshire, a new county. It here then ranges in altitude from about 360 feet above mean sea level to above 450 feet, estimated roughly. It flowers about the middle of April, or rather later and lingers on to the middle or end of May. It grows on bare, exposed spots of limestone rubbish, and seems therefore capable of enduring considerable cold. I doubt its occurring in pastures.

Lepidium ruderale in the Cybele is mentioned from near Bristol.

Does *Drosera rotundifolia* occur in the county? There seem few likely spots for it.

Dianthus Armeria is a local plant, the nature of its habitats is noteworthy.

The distribution of *Lychnis vespertina* and *diurna* is noticeable. The former is common in X, but I have not noticed the latter, though it occurs in Sapperton valley (in IX) and, I believe, at Chedworth (in XI).

Honkeneya peploides, a littoral plant, is said to be general in the Cybele. What littoral plants have we in the county?

Does *Linum perenne* occur in the county? Mr. Lees mentions it as in the province.

Geranium sylvaticum occurs in Warwick and Worcester; whilst *G. pyrenaicum* is not uncommon round Cirencester. Is the latter an escape?

Erodium maritimum occurs in the province.

Oxalis acetosella occurs at Blaize Bailey (in III), and, Mr. Elton informs me, at Chedworth, (in XI). Where else?

O. corniculata, a denizen, occurs somewhere in the county.

Euonymus europæus is abundant in X.

Is *Ulex europæus* as uncommon in other districts as in X? It is a calcifuge plant.

Genista tinctoria occurs on the Stroud road, near Oakley Park, (in X) and abundantly in a field between Kemble and Pool Keynes, just over the county-boundary, *i.e.* in Wiltshire.

Does *Sarothamnus scoparius* occur in the county. It chiefly, I believe, frequents sand and gravel; but I have not seen it wild in X.

Anthyllis Vulneraria seems rather local in X.

Trifolium fragiferum occurs wild on the farm of the Agricultural College.

Vicia Cracea I have not noticed in X.

Vicia sylvatica was found near the Tetbury Road Station, in 1875, by C. E. M. Russell, Esq., of the Agricultural College.

Vicia bithynica, a rare species is recorded from Gloucestershire in the 'Cybele.'

Lathyrus Aphaca, I found at Little Coxwell Gravel-pit, near Farringdon, Berkshire, not far from the boundary of XI.

Geum rivale and Poterium Sanguisorba both occur in X.

Lythrum Salicaria grows in the Cirencester Canal.

Circœa lutetiana was brought to me from Hunter's Gate, Oakley Park, by Mr. S. F. Elton.

Among escapes, Ribes Grossularia is noticeable as being very frequent in X, and *Sedum dasyphyllum,* as indicating, perhaps the carrying power of water, being found by Mr. Elton at the west mouth of the Sapperton Canal tunnel, by myself at Thames Head Bridge, and by Professor Church abundantly on walls at Down Ampney.

Cotyledon umbilicus occurs just over the Wilts border of X, at Ewen and Kemble, but I have not met with it within the county.

Not having carried out my examination of the Cybele Britannica beyond this point, I must for the remainder of my list content myself for the present with recent observational notes on a selection of species.

Saxifraga tridactylites is abundant on walls in X and the adjoining part of Wilts.

Chrysosplenium oppositifolium grows on the banks of the Little Avon at Dammary in V.

Does so confirmedly paludal a plant as Hydrocotyle occur in the county? It is widely distributed throughout Britain.

Pastinaca sativa is common in X in waste places, though only recorded for about half of Mr. WATSON's artificial 'counties' of Britain.

The *Mistletoe,* (Viscum album), so important an article of 'export' from the neighbouring counties of Hereford and Worcester, is by no means absent from our county, though most common in the Vale districts. I have noticed it on the apple at Stonehouse, in IV, and it grows on a variety of stocks at Birdlip in IX; but the only piece I know of in X is on a lime in Oakley Park.

Adoxa Moschatellina, which occurs in eighty-four out of Mr. WATSON's 112 counties, I have not heard of in the county, though it grows in hedge-banks in Oaksey meadows, Wilts, between the main county-boundary and the outlying Gloucestershire parish of Minety.

Dipsacus pilosus may be reckoned among our uncommon species. Mr. S. F. ELTON communicated a specimen to me from Sapperton.

To the same gentleman I am indebted for a specimen of *Scabiosa columbaria* from the Cathedral Firs, Oakley Park.

Petasites vulgaris occurs on the banks of the Churn at Perrott's Brook and Cirencester.

Campanula glomerata, a lime-loving plant grows abundantly by the side of the road from Cirencester to Barnsley.

Do any heaths occur in the county?

Mr. ELTON informs me that *Monotropa Hypopitys* occurs at Rough-hills, Oakley Park.

Erythræa Centaurium, a plant growing on light soils, pascual ericetal, viatical or glareal, grows at Oakley Park and elsewhere in X.

Chlora perfoliata is abundant on Rodborough Common, in IX.

Atropa Belladonna grows to a large size on Sapperton tunnel.

Hyoscyamus niger occurs on rubbish at Pitacre Pits, Cirencester and elsewhere.

Digitalis purpurea I have not seen in the county, but Mr. Elton has found it in a wood at Minety.

Linaria Cymbalaria, though not native, abounds on old walls in district X, and *L. spuria*, as a field-weed.

Veronica Buxbaumii, a recent colonist, is established on the Cotteswolds.

Pedicularis sylvatica occurs on Blaize Bailey, in III, and at Siddington, Ewen, and Kemble, in Wilts.

Rhinanthus Crista-galli minor, a semi-parasite, is only too abundant on the grass of Oakley Park.

Lathrœa squamaria occurs on the roots of the hazel in Oakley Park.

Thymus Serpyllum occurs on the Stroud road and Ackman Street, near Cirencester, and at Foss-bridge in XI.

Lithospermum arvense (?) occurs on rubbish at Soudley in VI.

Cynoglossum officinale occurs on the Stroud road near the Agricultural College, in Hayley Wood, and in Wilts, whilst *C. montanum* is recorded from the county by Hooker.

Daphne Laureola is very abundant in Oakley Park.

Parietaria diffusa occurs on the old bridges at Stroud.

Humulus Lupulus grows at Chedworth.

The introduced *Elodea canadensis*, or American Water-weed, seems to be dying out in the Canal.

In Oakley Park, besides Orchis mascula, maculata and Morio, Listera ovata, Epipactis latifolia and the saprophytic Neottia Nidus-Avis, there are, I believe, two species of Habenaria.

Ophrys apifera I found only over the Wiltshire boundary.

Spiranthes autumnalis Mr. Elton brought me from Sapperton Common.

Cephalanthera rubra, very rare, was formerly found in Pitchcombe Wood, in IX.

Narcissus Psendo narcissus abounds at Dammary.

Paris quadrifolia abounds in Oakley Park; but is remarkably variable in the number of its leaves.

Convallaria majalis also occurs there and in Chedworth Woods.

Fritillaria Meleagris grows in the Lammas Meads, Minety, on the Swill Brook.

Allium ursinum grows in Oakley Park and Hayley Wood.

Colchicum autumnale abounds in the former and occurs also in the latter locality, but no white varieties occur.

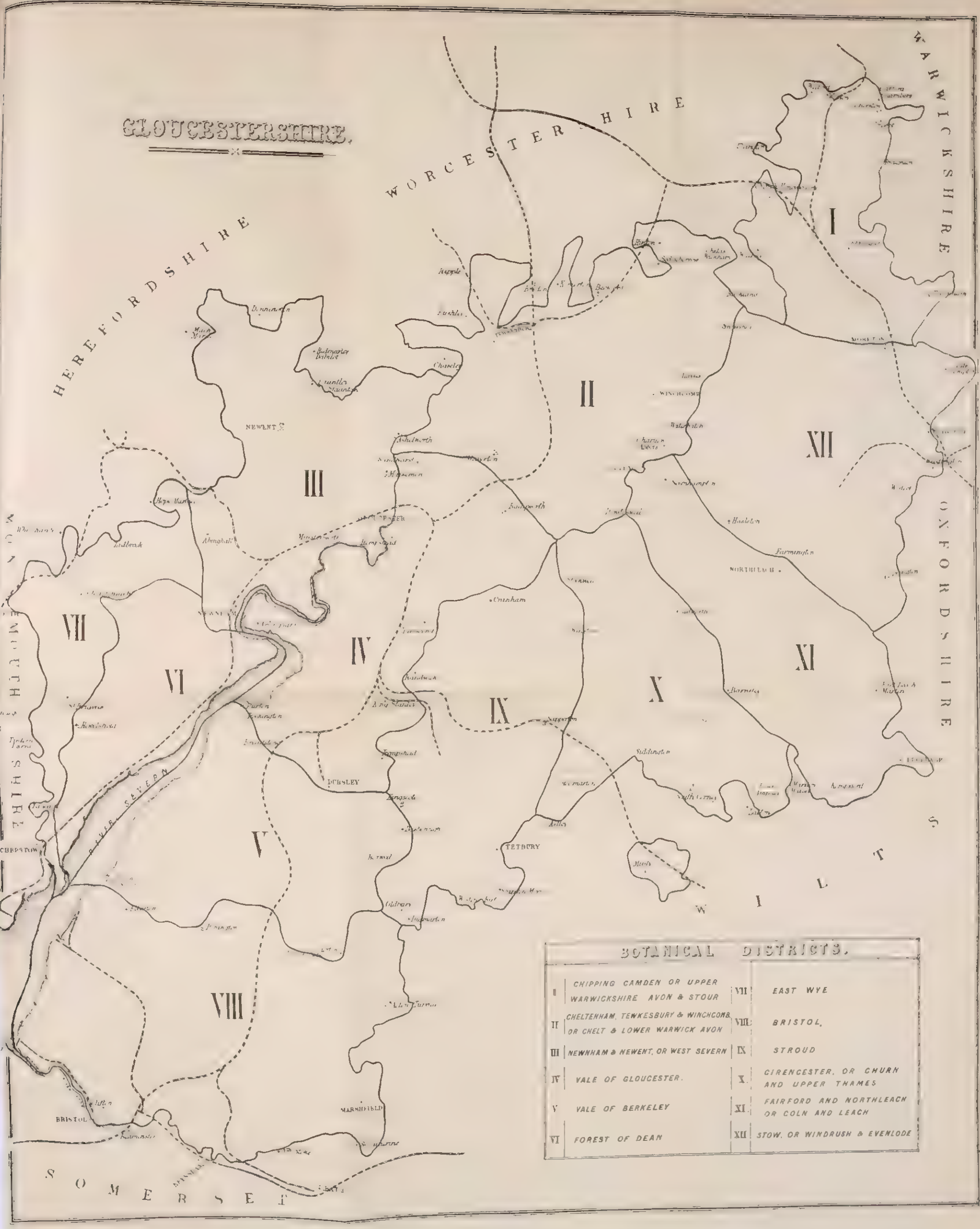
Passing, in conclusion, to the Ferns, I have only to say that they seem far more abundant in Wilts than in Gloucester; thus, on a wall at Kemble grow Asplenium Ruta-muraria, and Ceterach officinarum, whilst in addition to these A. Adiantum nigrum occurs on Thames Head Bridge.

Scolopendrium vulgare occurs in a well at Ampney Crucis and elsewhere.

Polypodium vulgare, at Dammary and on a pollard willow near South Cerney.

P. Robertianum, on Sapperton tunnel and in Wilts, and *Botrychium Lunaria* in Sapperton Park.

WARWI
E
Welford
Weston
Clifford Chambers
Atherston



BOTANICAL DISTRICTS.

I	CHIPPING CAMDEN OR UPPER WARWICKSHIRE AVON & STOUR	VII	EAST WYE
II	CHELTENHAM, TEWKESBURY & WINCHCOMB, OR CHELT & LOWER WARWICK AVON	VIII	BRISTOL.
III	NEWNHAM & NEWENT, OR WEST SEVERN	IX	STROUD
IV	VALE OF GLOUCESTER.	X	CIRENCESTER, OR CHURN AND UPPER THAMES
V	VALE OF BERKELEY	XI	FAIRFORD AND NORTHLEACH OR COLN AND LEACH
VI	FOREST OF DEAN	XII	STOW, OR WINDRUSH & EVENLODE

Gloucester, the Roman Glevum,

by Dr. Hübner.

[The following article, based in great part upon my paper on the walls of Gloucester in the last fasiculus of the Transactions of the Cotteswold Club, is from the pen of Dr. Hübner of Berlin, author of "*Corpus Inscriptionum Latinarum,*" (the work referred to below as 'C.I.L.') The article appeared originally in a German Archæological Serial, from which this translation has been made by Dr. Maier, of Cheltenham College.

While Dr. Hübner has pointed out some mistakes into which I had fallen, and the correction of which will be of service in these Transactions, he has at the same time thrown such new light upon the early occupation of Gloucester, and the important position of the city with respect to the plan of the Roman Conquest of Britain, that this article carries our distinct knowledge not only of our local but of our national history one entire stage farther back than the limit to which it had previously extended.

The foot-notes are Dr. Hübner's, except in the three or four instances in which I have been obliged to give some explanation. For the sake of distinction, I have given these notes of my own in *italic*, and initialled them.

The pages given in the text refer to those of the paper as separately printed; not to those of the volume of the Cotteswold Transactions.

John Bellows.]

The little pamphlet mentioned below, the communication of which I owe to Professor Max Müller, is a useful contribution to the more accurate knowledge of Roman Britain. (1) The careful way in which it investigates and describes the establishment and the remains of a Roman Colony, recommend it to attentive perusal, and imitation, wherever, as for instance on the Rhine, similar problems are to be solved.

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(1) "John Bellows, on the Ancient Wall of Gloucester, and some Roman remains found in proximity to it in 1873, (from the proceedings of the Cotteswold Club for 1875) *Gloucester*, 1876, 38 pp. 8vo., with 6 Lithographed Plates" [not published].

That *Glevum* was a Roman Colony we only know through the Ravenna Cosmographer, who, following his Greek authority, writes the name *Glebon,* and expressly adds the word *Colonia,* (1) and from the fragmentary inscription found in that ancient watering-place *Aquae Sulis,* (Bath) which is not very far from Gloucester: this inscription mentions a decurion of the *Colonia Glevensis* eighty-five years of age. (2)

From time immemorial remains of Roman Settlements have been found everywhere in Gloucester; tiles (without inscriptions) and other building materials, tesselated pavements, arms, (3) pottery, articles of toilet, coins, now and then a relievo, two figures, representing perhaps Æsculapius and Hygeia. (4) The Architectural remains of the Roman Town have not been forgotten in the older works on the City and County, but we lack any really servicable accounts of them. The Author of the paper in question, a printer and publisher in Gloucester, carries on his business in a house partially built on the old wall of the City, and the substructure of one of the gates: (it is called Eastgate House, and was formerly the City Prison). For some considerable time he has lost no opportunity of establishing the level of the old town, which lies about eight feet below the present level of the streets, (p.46) partly by making excavations on a small scale, and partly by searching the cellars of the houses. By the aid of the rather vague description of a Roman Camp given in Polybius he endeavours, (pp. 14-16) first of all, to fix upon the position of the Prætorium. Here, however, a

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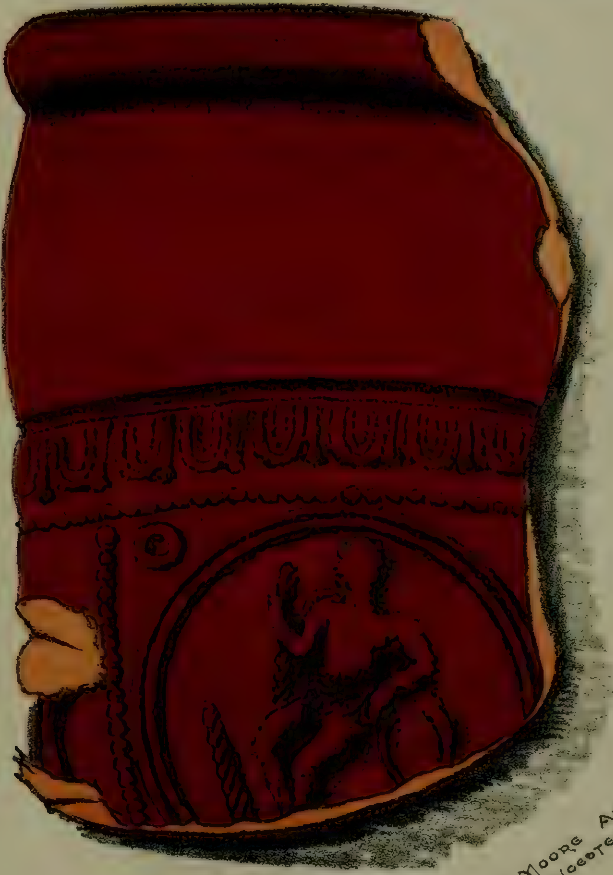
(1) 5. 31. p. 427, 12 Parthey.

(2) The Anglo-Saxon spellings of the name which occur, GLEAWANCEASTER the more ancient, and GLEAWECEASTER, the more modern, prove the originality and durability of the V in GLEVUM*;* GLEBON has B instead of V as in Greek.

(3) When the Author (p. 10) relates how the late W. ARKELL, whose collection is now in the Gloucester Museum, had found amongst other things a well preserved Roman-horse shoe, we must be permitted to doubt its Roman origin for the present. According to LINDENSCHMIT'S trustworthy observation, no Roman horse-shoes have been found in France or on the Rhine, except such as were destined for horses with diseased hoofs. The well-known old horse-shoes date back, without exception, no farther than the early middle ages.

(4) Vide the observations in C.I.L. VII, p. 32.

· FRAGMENT OF "SAMIAN" WARE ·
· FOUND AT EASTGATE, GLOUCESTER ·



· J. P. MOORE ARCHT. ·
· GLOUCESTER ·

NATURAL HISTORY

curious mistake occurs. SUETONIUS in his life of Cæsar (cap. 46) mentions that Cæsar carried tesselated pavement in his baggage on the march. Whether it be possible, or probable, that there might have been amongst Cæsar's baggage tessellated-pavement-pieces, I will leave undecided; many reasons might be alleged which would give rise to exaggerated reports of this kind. From this anecdote, the author, or perhaps some English authority which he follows,* concludes that *all* Roman generals took tesselated pavements about with them, that, therefore, a tesselated pavement, in the first century of our era, had been a mark of the quarters of the commanding-general. (1) The presence of the tesselated pavements no more indicates the situation of the Prætorium, than another circumstance mentioned in the author's treatise, the presence of oyster shells belonging to the smaller sort, the so-called "natives," whilst he traces the large common sort in the quarters of the common soldiers. Both sorts, he thinks, had been, by the quick postal communication of the Romans, directly supplied from Colchester (*Camulodunum*): (p.5) may they not have come from the west coast as well, which is a good deal nearer? Also from the presence of more elegant or coarser pottery he draws similar conclusions. (p. 16) We need not be surprised at his falling into the general mistake of local savants, over-estimation of their own limited field of investigation. He carefully guards himself, however, and we must give him credit for this, from any unsafe hypothesis based upon the observation of the layers of the soil. With the greatest care he traces and exhibits the line of the old enceinte walls, and of the outer ditch (the width of which he estimates at 100 feet), besides the position and size of the gates with their barbicans (which he calculates at 60 × 50 feet or 3000 square feet, consequently, like the so-called mile towers of the wall of Hadrian), the Quays of the River Sabrina (Severn) and of one of its little tributaries, the Twyver (p. 24), which has disappeared, and the existence of which is proved by the finding of an old boat, and the former existence of a water-mill. (p.33) The total length of the walls is found to be almost identical with those of the Colonies *Eburacum* (York), and *Lindum* (Lincoln), namely from 1200 to 1300 feet; (1) the total area of the oblong, as the red lines on the plan (plate 4) show, being about 2,022,000 square feet. The author had in his researches the advantage of the intelligent and active co-operation of an officer and a soldier of the Ordnance Survey (p.18). He did not hesitate to ask his neighbours for permission to examine their cellars; and he describes with a certain gusto, how his subterranean visits now and then furnished him with "proofs of 9 feet thickness," for the correctness of the direction as assigned by him to the City Walls (p. 18). He further mentions with what distrust the daughter of a beer-seller saw the fine-looking sergeant of the Engineers climb about between the casks of beer in her father's cellar; he relates too, how he himself crawled about on his hands and knees, lantern in hand, through the damp passages, sometimes frightened by mischevous dogs, and such like. The disappearance of these mighty walls is accounted for chiefly by an Edict of King Charles II, by which everybody who chose, was allowed to cart away stones from the wall (pp. 3 and 17). The King wished to do away with the fortifications of the town which had offered resistance to his father; * up to that time they seem to have existed on a very extensive scale; modern progress has done the rest at Gloucester as elsewhere. The recollections of one of the oldest inhabitants of the town, (Capt. Price, aet. 82), popular traditions, and the old names of streets and localities, are used in a cautious manner which inspires confidence, wherever objects or facts are mentioned, which no longer exist. Perhaps the author goes a little too far in trying to account for the name Bareland by the Roman Pomœrium. (p. 27)

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(1) "It would seem indeed" he says, (p. 7) "to have been made use of as an emblem of the permanent conquest of the spot on which his tent was pitched: somewhat as we (the English) now annex a newly discovered island by planting the British flag; for SUETONIUS .... states," &c., &c.

* *My authority is the careful, though anonymous writer, of the really excellent article on the Roman wall of London, in the appendix to "Leland's Itinerary." J.B.*

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(1) The circumference of the old Colony of Eburacum is in reality, and as we may expect from the importance of the place, somewhat larger. The most recent treatise about it, G. T. Clark's lecture on the defences of York (Arch. Journ. 31, 1874, p. 221—ff), which, however, treats principally of the post-Roman enlargement of the fortifications of York, gives 452 to 530 yards, *i.e.* 1356 to 1690 feet as the circumference of the walls, referring to Skaif's antiquarian map of York, which is not at hand.

* *I mentioned this on the authority of popular tradition at Gloucester. Since doing so, I find there is no documentary evidence to support it. J. B.*

Thus unfolds itself before his mental eye a complete picture of the old fortifications of Glevum, with their battlemented walls, towers, and gates. The Drawing Master of the Gloucester School of Art, Mr. John Kemp, has sketched a view for the bodily eyes of the reader, which is added to the pamphlet in a nicely lithographed plate (p. 28). Of more value than this harmless trifle are the measurements of stones from the old city walls, (consisting of the Oolite of the district), which are given in several instances. One of these stones was 7 feet long and 1 foot 9 inches thick; its length formed the depth of the wall, the smaller side being in front (p 28). A well preserved piece of wall still shows stones 3 to 4 feet in length; he calls it "a very striking sight" (p. 28). Plate 1 (after the sketch of J. P. Moore,) gives an interesting view of the large piece of the wall preserved, almost 50 feet long, close to the author's house at the Eastgate, together with the elevation and the details of the same. The actual fabric of the wall rests on a foundation of large blocks, similar to the one mentioned, and which were intersected by drain spaces; the fabric itself consists of hewn stones, about 12 inches long, 11 inches wide, and 5 inches high. The core of the wall, which is almost 10 feet wide at the bottom, and diminishes proportionately towards the top, is formed by a rubble of boulder and grouted mortar, as hard as rock; the additions above it do not date further back than the middle ages. At irregular intervals of from three to five feet, but at the same height, carefully-preserved square holes are found in the masonry. The author identifies them by a Vitruvian prescription (p. 31) about the building of walls, according to which, beams of olive wood were to be inserted for the strengthening of the fabric. (1) As there were no olive trees in England, oaken beams had been used according to the author's opinion, which he supports by the presence of vegetable mould found in those holes. I leave it to the professional man to decide whether these holes were not merely meant to fix the scaffolding, and have been left empty after having fulfilled their purpose. The structure of the wall of Hadrian, well known through Bruce's excellent treatises, (1) being identical with the Gloucester one, the author puts the date of the walls of Glevum at the time of the Emperor Hadrian. But this is decidedly not a conclusive argument. The mode of construction in itself dates back to time immemorial, and was undoubtedly used whenever the want, or the inferior quality of the material, or shortness of time, recommended it in preference to the costly massive free-stone. The measurements too of the facing-stones of the wall of Hadrian, are entirely different. (2) The two modes of construction agree, but in this one point, that there are not, as is the case with the Roman structures of northern Italy, and other provinces, and in some instances in the south of England, rows of tiles between the facing-stones. All these considerations seem to have induced the author to consider the two as identical. But the absence of tiles has been noticed in many other Roman structures in Britain and elsewhere, and may partly be accounted for by the want of the proper clay for the manufacturing of tiles, and the more abundant supply of stones; partly also by the quicker way in which the latter can be obtained. I cannot, it is true, state with certainty, whether roughly hewn sandstones can always be more quickly prepared than tiles, when carefully made. In very few places only we find, instead of the rough conglomerate, that mode of construction which the English call *herring-bone* work: evenly hewn stones are placed in straight rows, their points in an oblique direction, and set in mortar; thus giving an appearance like fish-bones. The portions of the walls of Glevum built in this manner (pp. 19 & 29) the author considers as of more modern origin; for my part, however, I am rather inclined to think that the reverse is the case, and that the more careful, although less solid mode of construction, may be the more ancient.* The author himself thinks that the fact of the same sort of structures being found in Venta Silurum, the Caerwent of to-day, (1) rather indicates a more ancient date. He says (p. 30) that Venta being situated farther east than Caerleon, must have been occupied before Isca (Caerleon, in South Wales); Isca, however, was only, after the second half of the 2nd century, the head quarters of the second Legion, (2) which took part in the construction of the wall of Hadrian. The same Legion also built the walls of Isca, a fact which is beyond all doubt, and from this the writer of this paper draws the further conclusion, that Glevum too is a work of the second Legion. This conclusion is very unsafe; up till now, no tiles have been found in Gloucester bearing the mark of any Legion, nor any stone bearing an inscription: (3) on one single facing-stone only of the wall structure, has been found a smooth place which had been destined for, and probably once bore, an inscription, of which, however, no trace remains. From reasons of another kind, however, which the author has not, and could not very well have known, it is highly probable that Glevum was one of the oldest Colonies of the south of Britain. A glance at the map shews us Camulodunum (Colchester) in the east, and Glevum (Gloucester) in the west, almost exactly under the same degree of latitude.

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(1) Vitruvius, 1, 5, in crassitudine perpetuae taleae oleagineae ustilatae quam creberrimae instruantur, uti utraeque muri frontes inter se, quemadmodum fibulis, his taleis conligatae aeternam habeant firmitatem.

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(1) Vide my notice in the Jenaer Litteraturzeitung, 1875, p. 868.

(2) "Bruce's Roman Wall" (3rd edit. London, 1867. 4) p. 81. They are mostly 15 to 20 inches long, 8 to 9 inches thick, and 10 to 11 inches wide.

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* *The herring-bone masonry at Gloucester forms the* upper part only *of the wall. It must therefore be later than the grouted masonry below it. J. B.*

(1) Compare C.I.L. (vii, p. 37) at the conclusion of the Chapter on Isca.

(2) C.I.L. vii, p. 37.

(3) The only monument with an inscription mentioned by Mr. Bellows. (p. 13, plate 2) is a fragment of red, so-called, Samian Pottery, with a mark on the outside (as on the pieces joined together on the C.I.L. vii, 1337.)

M. F. G EMIN.M

It is, perhaps, identical with the mark GEMIN......C.I.L. vii, 1337-36, and means *M.F(lavi) Gemin(i) M(anu).* Inside of such pottery we frequently find the mark *Gemini*, or *Gemini M(anu)*, or *Gemin(us) f(ecit)*, compare C.I.L. vii, 1336, 477. There are six other marks of pottery which Mr. B. does not give. On this occasion he laughs at the *amusing affectation* of the Antiquaries who avoid the term "Samian Pottery," whilst we call Porcelain manufactured in Worcester or Sèvres, "China." The difference, however, is that our porcelain is intended to represent and to replace the Chinese, whilst the red Samian pottery never had such pretension with regard to the Samian.

The detailed account of the Claudian expedition has been lost, with the second half decade of Tacitus' History; the short characteristic notices on the corresponding events in "Agricola" (chapter 14 and following) and in the History, (3, 44 and following) cannot, of course, replace it; but with the help of the accounts given in the Annals on the events which took place somewhat later, at the time of the second legate of the Province, nine years after the conquest (1), we are able to draw the following conclusions from the monuments which are still preserved. Immediately after the landing, after the places on the coast had been occupied and alliances concluded with some of the native princes, A. Plautius, the first legate of the Province (A.D. 43 44), seems to have concentrated his army in Venta Belgarum (Winchester) about the centre of the southern part of the peninsula. Only one stone with an inscription has been found, up till now, in this spot (C.I.L. vii, 5); it belongs, probably, to the end of the first, or, the latest, to the beginning of the second century.

The Inscription is:—

MATRIB(US) ITA(LI)S GERMANIS GAL(LIS) BRIT(ANNIS)
[A]NTONIUS [LU]CRETIANUS [B(ENE)]F(ICIARIUS)
CO(N)S(ULARIS) REST(ITUIT) (2)

This is a consecration offered in days of old to the Italian, Germanic, Gallic, and Britannic Mothers, the sacred protectresses of those nationalities which furnished recruits to the four legions of the army of occupation, to the II Augustan, the XIV Gemina, the IX Hispana, and the XX Valeria Victrix, and to their native allies. This inscription was restored by a beneficiary of the consular legate of the Province, who may have had his office there in the 2nd century. The Roman Roads which are still in existence, and the position of the Roman settlements, explain the further advance. Advancing by way of Calleva (Silchester), P. Ostorius Scapula first of all fortified some places on the coast, to keep open the Maritime connection with Gaul and Germany, and thus secured the first chief section of the Island, as far as the line between the estuaries of the Thamesis and the Sabrina (the mouth of the Thames and the Bristol Channel). The Colony of Camulodunum, or a fortified camp in the neighbourhood, established by Ostorius (Agric. 14), for the purpose of subduing the Ikeni who lived further east, was most probably the standing quarters (later on also a Colony for veterans) of the 14th Legion. This is borne out by the account of the rebellion of Queen Boadicea, which rebellion was put down by the legate of Nero, Suetonius Paullinus, with the help of this Legion (1). For the same reason this Legion was the most convenient to order from Britain to Germany for the purpose of fighting against Civilis (Hist. 4, 68-76), after which it did not return to Britain. Even before the foundation of Camulodunum (the date may have been altered by Tacitus (2) or his authority, in the purposely shortened account F, in order to conform to local tradition), the legate had purposed *cuncta castris Avonam inter et Sabrinam fluvios cohibere:* (3) this is exactly the western region corresponding with Colchester in the east, only lying somewhat nearer Venta—Calleva, the main line of operation. This explains the campaign against Caractacus, which, although ending in a brilliant victory of the Roman troops, and the capture of the British Prince, yet did not, as the wording of the account clearly proves, result in a permanent occupation of the territory of the Siluri and Ordoviki (4). The

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(1) Vide Rheinische Museum für Philologie, 1857, p. 47.

(2) An excellent woodcut which I have before me, and which I owe to the kindness of Mr. A. S. Murray (the inscription is in the British Museum), fairly completes the interpretation I put on it previously: at the beginning of line 6 two letters have been effaced, and we must, therefore, read instead of the name Cretianus, which I ought to have rejected from the first, Lucretianus.

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(1) Ann. 14, 34 jam Suetonio quarta decuma legio cum vexillariis vicensimanis et e proximis auxiliares.........erant. Compare C.I.L. vii, p. 34.

(2) Ann. 12, 40 haec quamquam a duobus propraetoribus plures per annos gesta conjunxi, ne devisa haud perinde ad memoriam sui valerent.

(3) Ann. 12, 31, according to Nipperdey's interpretation of the text, which I consider the most probable.

(4) Ann. 12, 38 *Censentur Ostorio*—after the pardon of Caractacus, described in such vivid and beautiful colours, which, to my surprise, no English artist has chosen for his subject—*Triumphi insignia, prosperis ad id rebus eius mox ambiguis, sive amoto Carataco, quasi debellatum foret, minus intenta apud nos militia fuit, sive hostes miseratione tanti regis acrius ad ultionem exarsere.*

Siluri surprise the *praefectus castrorum*, who appears here in his proper capacity of governor (Veget. 2. 10), and the Cohorts of the Legion who had been left behind. Only internal discord (Ann. 12. 40; Hist. 3. 45) re-establishes after P. Ostorius' death, under his successor, A. Diduis, the Roman Supremacy. Venta Silurum, and Isca Silurum were among the forts (1) erected against the Siluri; it is clear that the head quarters of the Legion were pushed to Isca much later, and after the complete subjection of South Wales. From this and another reason, I think it probable that Glevum constituted the original standing quarters of the Second, as Camulodunum that of the Fourteenth Legion.

The other reason is this: exactly in the same systematic and cautious manner in which the occupation of the Island had been carried out up till then, it seems to have been continued under the Legates of Nero and Vespasian, as far as we are able to judge from the only extant account in Agricola, and which is rather summary and highly coloured. The campaign of Suetonius, against the Isle of Mona (Angelsey), (Agric. 15) is only conceivable with a basis for his operations such as was afforded by the Colony of Deva (Chester), on the northern frontier of the territory of the Siluri and Ordoviki, and which was only completely conquered by Julius Frontinus (Agric 17). At Deva were always the standing quarters of the Twentieth Legion (2).

On the western side Petilius Cerialis, Vespasian's Legate, had begun the further advance against the Brigantes; the Colony of Lindum (Lincoln) is the geographical expression of these operations; probably the original standing quarters of the II *adjutrix* (3) sent to Britain by Vespasian merely for the purpose of this expedition. Lindum and Deva lie, again, corresponding with Camulodunum and Glevum, almost exactly in the same latitude, the one in the east between the estuaries of the Metaris and Abus,

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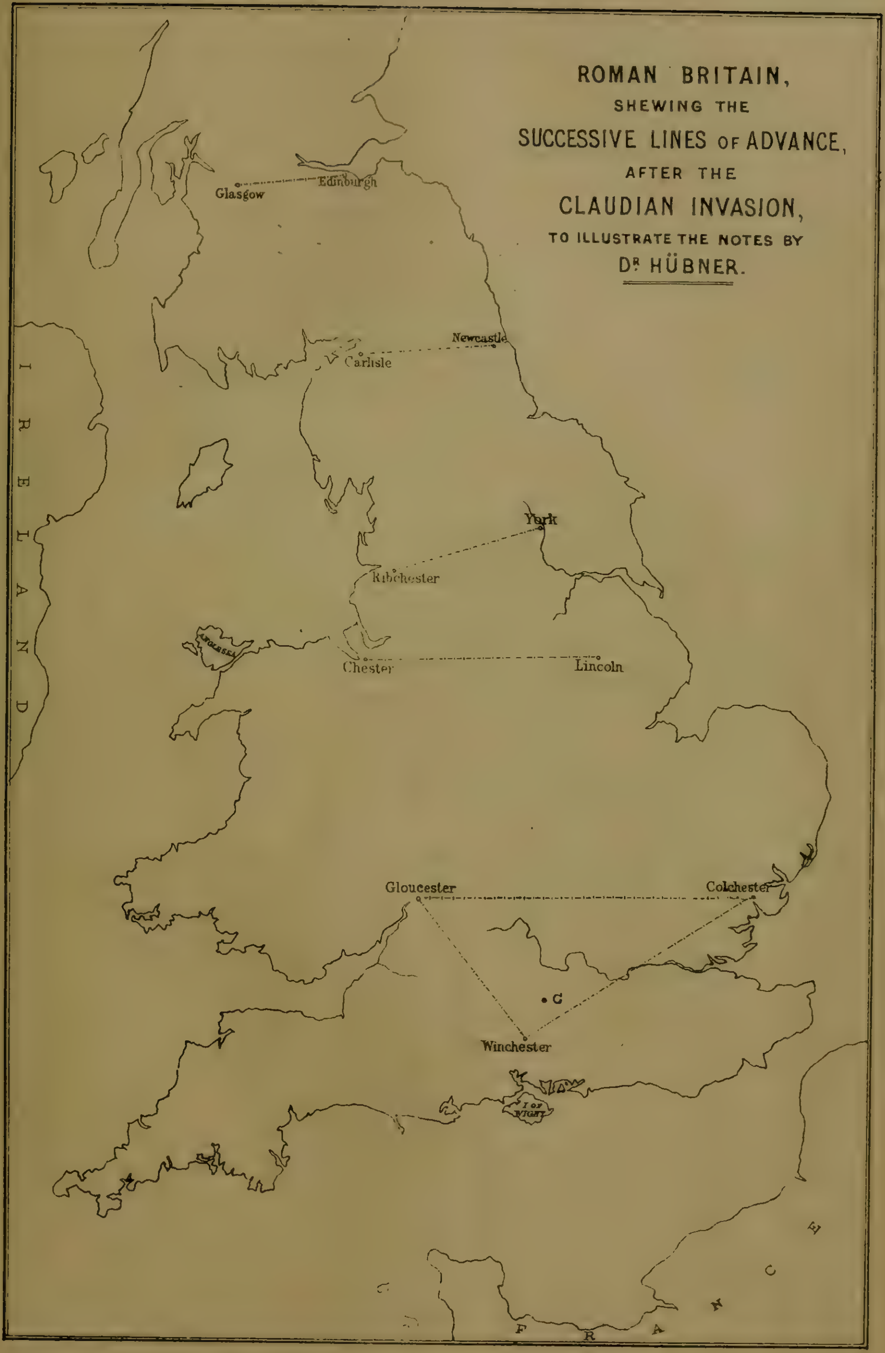
(1) Compare also Agric. 14, Diduis Gallus parta a prioribus continuit paucis admodum castellis in ulteriora promotis.

(2) C.I.L., VII, p. 47.

(3) C.I.L., VII, p. 51.



ROMAN BRITAIN,
SHEWING THE
SUCCESSIVE LINES OF ADVANCE,
AFTER THE
CLAUDIAN INVASION,
TO ILLUSTRATE THE NOTES BY
Dr HÜBNER.

BRITISH MUSEUM

the other in the west on the mouth of the river Deva, between the estuaries of the Segeia and Belisama, on the Irish Channel, and thus mark the second chief section of the Island in a proportionately narrow spot between the two seas. Finally, the preliminary strategic condition for Agricola's advance to the north (Agric. 25), undertaken after the failure of the expedition against Hibernia, which Agricola carefully disguises by clever wording (Agric. 24), was the establishment of the colony of Eburacum (York),* situated in the country of the Brigantes, in the natural prolongation of the line of Lindum, and of the forts between the mouth of the Tina and Ituna; Tacitus, it is true, nowhere mentions the name of Eburacum, and passes over the fact, probably as something which needs no comment. At Eburacum, undoubtedly and incontestably, were the standing quarters of the Ninth Hispanic Legion and, since Hadrian, of the Sixth, which took the place of the Ninth, after the annihilation of the latter. (1)

We need but mention the fact that the fortification by Hadrian (2) of the line between the estuaries of the rivers Tina and Ituna (the line Newcastle—Carlisle), the narrowest part of the Island, and finally the building of the wall of Pius between Clota and Bodotria (the line Edinburgh—Glasgow), where Agricola had already constructed and pulled down again some forts, (3) are only a repetition of the same strategic measures by which the southern parts of the Island were gradually occupied. On these two northern lines only, detachments (vexillations) of the four Britain Legions were in garrison for a time: the list of Cohorts and of Alae in charge of these lines, is well known.

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* *In the sketch-map I have prepared to accompany this article, I have taken the liberty of adding the position of Coccium (Ribchester;) inasmuch as both its command of the River Ribble, and its extent and splendour in the Roman period, when it appears to have been occupied by an advance of the XX legion from Deva (Chester), seem to shew its military importance as a parallel Station to Eburacum (York). These two places severed the North of Britain from the South, even more completely than Chester and Lincoln had done. Calleva (Silchester) should also have been shown on the sketch: it stands a short distance North by East from Winchester. The modern names are given in the map, for greater clearness. J. B.*

1. C.I.L., VII, p. 61. 2. C.I.L., VII, p. 99. 3. C.I.L., VII., p. 191.

The four original Legions of the army of occupation stationed in Britain in the first century, gradually received, one and all, according to the well-tried principles of Roman policy and warlike experience, large fortified Camps, with the institutions and arrangements of a town; the only one of these fortified Camps which remained to be traced was the one destined for the Second Legion. This *can only* have been Glevum, considering its situation and size, which, as we have seen, almost entirely correspond with that of Lindum and Eburacum. The circumstance of the missing inscriptions is partly explained by the subsequent removal of the head quarters to Isca, whose arrangements the author of the paper justly styles "a precise repeat of Gloucester" (p. 33): this, however, by no means implies, that there may not at some future time be dug from the foundations of the old houses at Gloucester, a stone bearing an inscription, and which would bear out my supposition. I do not expect to find any legionary tiles, for the oldest tiles found in England, those of the Twentieth Legion from Deva, and of the Ninth from Eburacum scarcely date back to the end of the first century; but it agrees very well with my supposition that coins of Claudius are the most frequently found in Gloucester(1). Also the copper coin mentioned in this paper, on which only a head with a long neck and the inscription AVG were distinguishable, is probably a coin of this Emperor, or of one of his predecessors. We can, therefore, with some accuracy, fix upon the year 50 of our era, as the date of the foundation of the Roman Colony of Glevum.

Thus, the monumental facts, the position, the size, and the style of the structures in the colony, an accurate knowledge of which we owe to the careful investigations recorded in the paper before us, furnish an important supplement to the traditions on the conquest of Britain, and to our knowledge of the ancient history of England.

Together with revision of the Roman roads of the Rhine district, undertaken by the Society of Rhenish Antiquaries, an accurate survey of all the Roman Colonies, Forts, and Stations, ought to be made (2).

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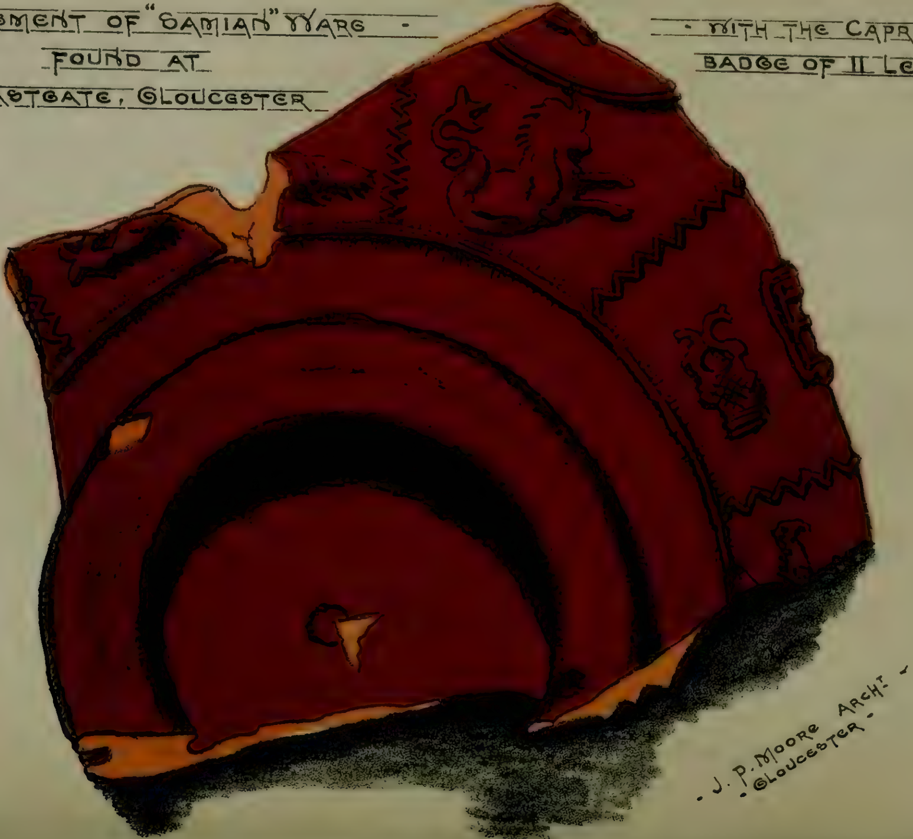
(4) Archæologia 18, 1815 p. 120.

- FRAGMENT OF "SAMIAN" WARE - WITH THE CAPRICORN
FOUND AT BADGE OF II LEGION
EASTGATE, GLOUCESTER



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It is well known how very little has been accomplished, and how unsatisfactory the work done in this branch has been, up till now; it would be a useful task for local savants, well versed in local literature, to collect and publish comprehensive summaries on the disconnected investigations and statements scattered over a large area.

The publications of such summaries in these Annals would indicate the gaps, and incite men interested in this kind of work to fill up these gaps. We might perhaps succeed, as is the case in England, in interesting the military authorities of our garrisons in this kind of work. An exhaustive technical investigation, and accurate comparison of the extant remains of Roman fortifications of Mayence, Trèves, and Cologne, merely to mention the most important points, would, for instance, in my opinion, furnish a proof that the walls and gates of Trèves, inclusive of the Porta Nigra, formed part of the original Claudian Colony, satisfactory even to those who have not allowed themselves to be convinced by all the arguments brought forward up till now. How much may be done by an earnest devotion, and an untiring diligence and energy, even with modest means, and without much learned apparatus, towards the solution of these most important historical problems, we note with pleasure from this communication on Roman GLEVUM.

Berlin. E. HÜBNER.

Since the publication of the paper in the Cotteswold Transactions, upon which the above article comments, I have found the actual emblem of the Second Augustan Legion on a piece of "Samian" pottery, among the remains at the East Gate of Gloucester. See article in the 1st *vol. of the Journal of the Bristol and Gloucestershire Archæological Society, "On the Roman wall of Gloucester."*

J. B.

Notes on the Tumuli of the Cotteswold Hills, and the human remains found therein. By Dr. BIRD.

The Barrows and Tumuli on the Cotteswold Hills vary in their size, position, structure, and contents. They are of three kinds. (1) Round Earth Tumuli. (2) Round Stone Tumuli. (3) Long Barrows.

I. ROUND EARTH TUMULI.

This is the earliest form of Tumulus. It consists of a mound of earth, or gravel, a few yards in diameter. The body is placed in the centre in a doubled up position, and with it are frequently found round balls of clay, sun-dried, and rude flint flakes. No traces of cremation are observed. A Tumulus of this description was discovered at Cubberly, to the north of the residence of the late Mr. HUTCHINSON; the skull, and some of the bones with the balls of clay, and flints were taken to the house, and the skull was afterwards sent to the Ethnological Society. It was a small skull, long, and narrow, and was slightly twisted, from pressure of the clay. The thigh and arm-bones were short; and the stature of the individual was not more than five feet.

A flint flake from this tumulus is preserved in the museum of Cheltenham College.

II. ROUND STONE TUMULI.

These are roughly constructed of loose surface or quarried stones. A Kist is generally placed near the centre; its sides and ends are formed of dry walling of small flat stones, and covered with rough unhewn stones, sloping each way like the roof of a house, or placed flat across the walls; and the Tumulus is raised up and formed into shape, with small surface stones; sometimes they are covered with a layer of earth, a few inches in thickness. The circle may be raised four or five feet in its highest part, and may be from twelve to twenty-six yards across.

The Kist may contain the bones of one, or many human bodies, of different ages and both sexes; also flint-flakes, and black rude pottery. Among the stones of the Tumulus, some distance from the Kist, human bones, flint-flakes, pottery, lumps of flint, round pieces of Bredon gravel, horses, cattle, and pigs' bones and teeth, shank bones of horses, and cattle, divided vertically, calcined human bones, stones, and charcoal may be found.

The bones contained in the Round Tumuli appear to be the remains of a people with long, oval skulls, large bases, and low vaults, wide behind, but narrow, low and contracted in front, with prominent frontal ridges, large frontal sinuses and a depression above those parts in the frontal bone; high cheek-bones, and large angular lower jaws. The bones of the extremities are large and strong, and the processes and ridges well marked, thus shewing that they belonged to a tall, square-built muscular people; some of the bones had been fractured, and again united; a humerus in Dry Heathfield Tumulus, and a parietal bone from the Waste Tumulus. Many of the thigh-bones were peculiar in having a wide, flat, oblong space, below the trochanter major. The persons to whom these thigh-bones belonged differed in height from five feet five inches to six feet and upwards.

TUMULUS AT HALLINGS.

At Hallings, in a field called the Waste, near Rockhampton, there are several Round Tumuli: one was some years since removed to get stone for mending the roads; it contained a Kist in the centre, with remains of seven human beings, of both sexes—some were of children. The Tumulus was twenty yards in diameter, it was covered with small surface stones and earth, and was raised about five feet in the centre above the level of the field. Outside the Kist were small heaps of charcoal, several flint flakes, and teeth and bones of animals. The skulls were long with broad bases, projecting jaws, high cheek-bones, and low vaulted. A depression, the result of a fracture, was observed upon the parietal-bone of one skull, which may have resulted from a blow. (A flatness upon the upper and outer part of the femur, is a common peculiarity; the ridges, processes and attachment of muscles are strongly developed.) The bones in the skull varied in thickness from the ordinary thickness in the frontal, and parietal, and occipital-bones, to nearly half an inch: some of the thigh-bones were eighteen and nineteen inches long. Some of the skulls were twenty-two inches in circumference; from ear to ear twelve inches; from the occipital ridge to the frontal 14 inches; across the base five inches; the height of some of the frontal-bones, five inches and a half, and six inches wide. The occipital-bones were large, three inches from occipital ridge to the Lambdoidal suture.

It was stated that about half-a-mile from this spot, several Tumuli were removed; the stones were used in mending roads, and the human bones were buried in the churchyard. The fields near Halling contain many flints.

ROUND TUMULUS,

In Dry Heathfield, Leckhampton.

This is situated a little to the West of some dry old wall foundations, supposed to have been the remains of a British village, and before my visit it had been examined by Messrs. Gomond and Bell. It was about twenty yards across; the Kist was about six feet long, two feet wide, and two deep, the sides and ends were formed of neat dry walling of Stonesfield slate, the covering stones had been removed, and all its parts much disturbed. It contained human remains of both sexes, of various ages: there were also traces of cremation; the skulls were long with wide bases, flat on the sides and low in the roof, the frontal bones were contracted and narrow, and had no traces of sagittal sutures, even in the bones of the children.

Fourteen thigh-bones were found, so that at least seven persons had been placed there. There were portions of three lower jaws, and of one upper jaw. The largest thigh bones measured eighteen inches in length, and three inches and a half in circumference. The usual length of the human trunk is about two feet five inches, the thigh-bones and legs are about the same length, a calculation from the above measurement would give a height of about five feet eight inches. The occipital-bones were large; the parietal-bones were small and flattened. The length of one skull from the occipital foramen to the lower edge of the frontal bone, was fifteen inches and a half; from ear to ear eleven inches, and the circumference twenty inches. There was only a small portion of the frontal-bone. The form of the occipital-bones, and posterior parts of the parietal-bones, are peculiar, being large and expanded below, and narrow and contracted above. A large and small tibia belonged to a male and female: two arm-bones indicated the same thing; the structure of the smaller bones being finer and of a more delicate structure.

A thigh-bone, eighteen inches long, had a united fracture across its middle. Another thigh-bone was hardened and irregular on its outer surface, with an opening an inch long, and a quarter of an inch wide, a little below its middle, which appeared like the result of disease.

THE FOXCOTE TUMULUS.

In this Tumulus there were two Roman coins and a half found in the black earth, and a broken earthen vessel containing small coins. There was a dry wall across the heap of stones, and a Kist near its centre; the ends and sides of it formed of flat stones placed on their edges and covered with flat stones two feet square. The Kist contained the remains of only one female. The skull was of the same shape as those found in the field at Halling, viz.,—long, broad at the base; twenty-one inches in circumference; low vaulted; narrow, low, and contracted in front, with prominent frontal ridges; a depression above; high cheek-bones, and large angular lower-jaw. The bones of the arms were long and strong: the sacrum was spongy, and in a diseased state. The flint flakes, were about fourteen altogether; the largest were in the red earth on the base of the Tumulus. The Tumulus measured twenty-six yards in one direction, and twenty-three in the other, and the centre was raised from eight to ten feet.

ROUND TUMULUS,

Near Chedworth Roman Villa.

This contained a Kist of flat stones for sides, ends and covering, about three feet by two, and contained a rude earthenware vessel with burned human bones of a female; the urn and burned bones are preserved at Chedworth Villa.

Round Tumuli are common on Cleeve Hill, and most parts of the Cotteswolds. I think that the Race who used this form of burial, existed through the Long Barrow period, up to the Roman or historic period.

III. LONG BARROWS.

The Long Tumuli are constructed in a superior manner, as compared with the Round Tumuli: they are formed of loose surface or quarried stones, having dry walling running through or across them in different directions, to support and maintain their form. They gradually rise from the surface of the ground, at their smallest end, to several feet above it at their large and wider end, where there are dry walling entrances, and large stones placed in the form of platforms or altars.

The skulls found in the Vaults and Kists of the Long Tumuli, are more square and higher vaulted than those of the Round. The forehead being higher and wider, the frontal sinuses and orbital ridges being much less prominent, and the depression above those parts being very slight, much less so than in the long, large, oval heads, of the Round Tumuli, with which they are mixed, and they may be termed large based square skulls. Dr. Paine has described the Bown Hill Tumulus, near Stroud, which contained the remains of five individuals, an infant clavicle, and a rudely-made bone chisel or scoop. Uley Barrow has been described by Dr. Thurnam; and the Nymphsfield Barrow, by Professor Buckman and Dr. Thurnam. The Long Barrow upon the Crippetts, or Shurdington Hill, has been disturbed, and its covering stones removed; but the burial places, have not been discovered. It is placed nearly east and west; is sixty-three yards long; thirty-four across its eastern or wider part, and twenty across its smaller, or western end; it varies in height from twelve to twenty feet.

Belas Knapp, a Long Barrow situated above Honeybee Wood, near Winchcomb, is constructed of quarried stones, and the large covering stones appear to have been procured from an adjoining quarry. It is sixty-three yards long; thirty-two across its northern or higher and wider part, and twenty-three across its southern, lower and narrower part; it is fourteen feet high at the stonework or platform, and gradually falls off to near a level with the ground, on its southern and small end. The three large stones on the western side may have been the covering of graves near the middle of the Tumulus which had been removed on a former occasion.

The neat stone walling of Stonesfield Slate, gracefully curved to form the heart-shaped entrance, with the huge unhewn stones placed at its northern end to form a platform, presented a most imposing appearance. A large jaw-bone; a long square skull; and bones of children, and infants, were found upon, under and near the large flat stone, with a bone pin, and a bone implement, with two small holes drilled in its end; and a beautifully cut flint saw, with a knife-edge on the back; boars' jaw-bones, teeth, and tusks; horses' teeth; a bone of the roebuck; bones of birds; and the upper part of a large radius which has been supposed to belong to a lion or cave bear. Graves were found in the small end, on its eastern side, formed of rough dry walling of quarried stones for the sides and ends, and covered or roofed over with flat, rough, unhewn stones; and the entrance to the graves was covered with a large stone, five feet by three, and about a foot thick. The grave contained the bones of several individuals, with large oval heads, and narrow foreheads.

In Rodmarton Tumulus, lately opened by the Rev. S. Lysons, the large unhewn stones, were placed in the eastern end, there was no walled entrance, a vault, covered with a large stone, resting on rough dry walling, and the entrance was formed of flat stones, two of which were curiously placed to form an arch-way into the grave, covered behind with another flat stone. The grave contained the bones of eight adults, male and female; bones of youths, and of children, some of which were burnt; all the skulls were long, large based, and well developed; the long and more square ones were broken. A long, large piece of flint, neatly shaped flint arrow heads, jaw-bones, teeth and tusks of boars, horses, and cattle, were found at the eastern end. The whole Tumulus was supported and divided with rough, strong, dry walling of quarried stones.

The Long Barrows frequently contain neatly finished flint arrow heads; flint saws; knives; rude bone implements; and very ancient pottery. Agriculture does not seem to have been known, for only the remains of wild indigenous animals are found; but the worn state of the teeth may have been produced by masticating seeds of plants, hard fruits, acorns, and wild kinds of grain.

THE PHYSICAL CHARACTERS OF THE SEVERAL RACES OF MEN.

The bones found in the Round Tumuli indicate peculiar and distinctive races. Those in the Round Earth Tumuli indicate a small race, the males not more than 5 feet in height, the females probably less. They may perhaps be identical with the Cave Dwellers, and may belong to the periods of the Mammoth and Rein-deer.

The people of the Round Stone Tumuli were tall, stout, square built, and athletic, varying in height from five feet six inches to above six feet. They had long, oval heads, with large bases, wide and expanded behind, narrow, low, and contracted in front; the frontal sinuses and orbital ridges are prominent, with a wide and deep depression in the frontal bone above those parts. The cheek bones are large and high; the jaws large and strong, and the lower jaw deep and square at the chin, and angles. The teeth are fine and white and free from caries, although in some instances, much worn away on their outer edges. The women were above five feet, and had the same general character of formation as the men, and presented clearly the female distinctions, the bones being smaller and more delicately formed: no sagittal suture could be discovered in the frontal bones of many of the children, and infants.

The human remains discovered in the Long Tumuli differ from those of the Round Tumuli, and are often mixed: they may have belonged to another, or mixed race. These were tall, stout, strong and square built; with long heads, large bases, fairly developed foreheads, no great projection of the orbital ridges, or depression in the frontal-bone; and the facial-bones did not project so much; but the lower jaw was deep and square at the chin and angles: the teeth are free from caries, although, in many instances, they are worn away obliquely on their outer edges. (Many of the thigh-bones in both races have an oblong square surface on their outer-side, below the trochanter major.) The ridges and processes are very prominent and strong; some of the thigh-bones measured more than nineteen inches; the female bones of this race were larger and less distinctly marked than in the Round Tumuli bones. Most of the developed skulls found in the vaults of the Long Tumuli, were broken across the vertex; and Dr. THURNAM suggests that such broken skulls found at Rodmarton Tumulus, may have been broken before death; being the remains of murdered prisoners, or of persons slain for sacrificial purposes.

Bodies are often discovered some feet deep or nearer the surface, near Tumuli, Barrows, and Knapps, presenting the Round Tumulus character of skeleton: as the bones recently discovered near the surface of the soil in St. James's Square, Cheltenham, where a Knapp and burial place formerly existed, described in Goding's History of Cheltenham. For this and other reasons, we may infer, that only chiefs and their families were placed in Tumuli and Barrows.

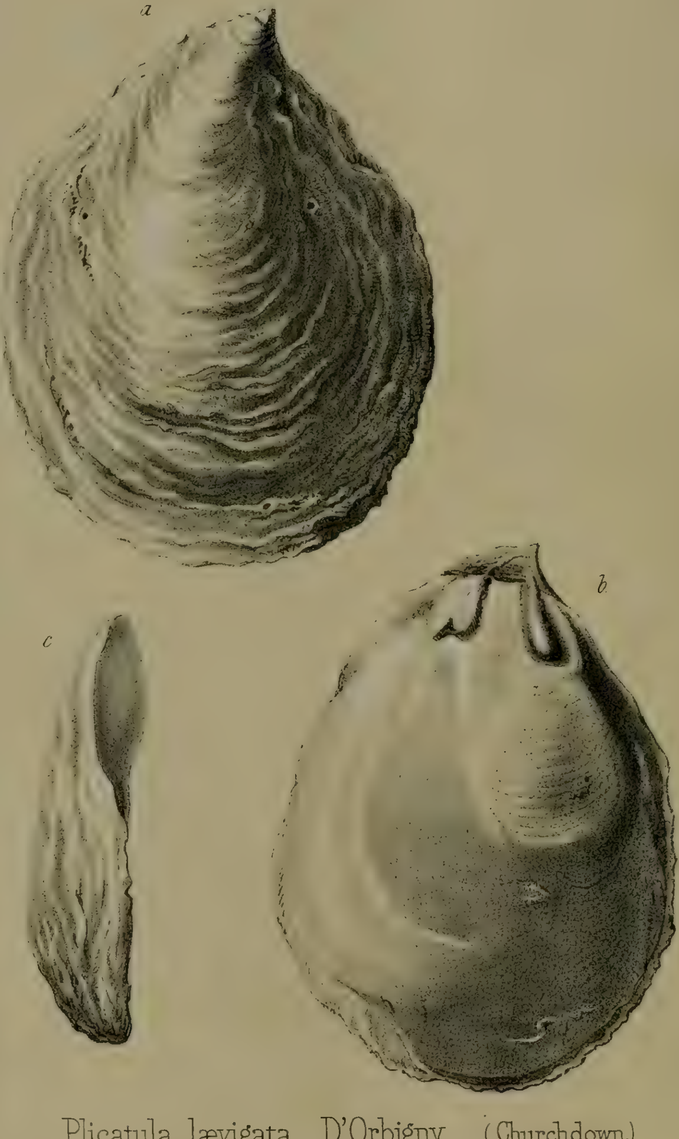
No gold, silver, bronze, iron, or other metal have been found in these Tumuli and Barrows; but Roman and English coins, iron nails and spikes, Roman and common pottery, have often been collected on their surface, and in the black earth of their outer covering.

CREMATION.

In most of the Tumuli and Barrows, indications of Cremation are found. In the Nymphsfield Barrow, the burnt bones were carefully placed in separate Kists, eighteen inches long, and twelve inches wide, on the north side of the chambers. These Kists contained only human calcined bones, parts of skulls, ribs, arms, and vertebræ of young persons or children. In Rodmarton Barrow, a few calcined bones of children were found in the vault, on the north side. In the Dry Heathfield Tumulus, the burnt bones were found on the floor of the Tumulus, outside of the Kist, near its eastern end. Dr. Paine, writing upon Bown Barrow, says "I should mention also that there were no signs of Cremation having been practised within this burial place; the bones were untouched by fire, although the surface of the mound bore evident indications of this action." There were no human nor animal calcined bones found. In Belas Knapp Barrow, traces of fire were observed upon its surface, but no calcined human nor animal bones were found.

On the floor of the Round Tumulus at Hallings, the signs of burning consisted of charcoal and burnt stones; it was six or seven feet removed from the Kist.

BRITISH MUSEUM



Plicatula lævigata. D'Orbigny. (Churchdown.)

Frederick Smith, delt

On the Occurrence of Plicatula lævigata of d'Orbigny in the Middle Lias of Gloucestershire, by

FREDERICK SMITHE, LL.D., F.G.S., ETC.

The *Plicatula* of LAMARCK (*Harpax* of Parkinson) is a genus which embraces both fossil and recent species, and is included in the family Ostreidæ of the acaleph mollusca.

As a genus, it was established by LAMARCK in 1810, who based it upon his observation of the hinge character of *Spondylus plicatulus*, a mollusc still living in the Red Sea. The animal of *Plicatula* is an inhabitant of warm seas, resembling *Spondylus* in every essential respect, and is only like Ostrea in that the foot is obsolete or nearly so; for the shell being always attached, the animal is stationary and needs no power of locomotion. Still, between LAMARCK's type and the recent shell, there exists merely a general resemblance of character. The teeth are two in number, in the form of an inverted V, and are borne by the right valve. Confining our observations to the liassic species of the genus *Plicatulæ*, we first notice that our most familiar form, is that of the *Plicatula Spinosa*, a small protean shell which ranges through nearly the whole of the Lias formation, adapting itself with versatile character to whatever surface may be available. On the continent of Europe, indeed, the little *P. Spinosa* is so abundant at particular places, Cérny, for instance, in the Middle Lias of Upper Normandy, that the beds in which it predominates are designated by M. JULES MARCOU, the "*Marnes à plicatules.*" Leaving this comparatively pigmy shell, we now come to the fine species which I was fortunate enough, in 1875, to add to our liasic fauna; and whose general distribution it will be desirable first to consider. The *Plicatula lævigata* of d'Orbigny, recorded until now as a French Middle Lias species exclusively, occurs profusely, according to M. Dumortier, at two places, St. Fortunat, and at Givérdy, but is much rarer in other parts of the Rhone district, as at Collonges, Polymieux, and the neighbourhood of St. Bonnet de Cray (Saône et Loire).

M. A. d'Orbigny indicates it at Brulon (Sarthe), and M. E. Deslongchamps, under the name of its synonym, "*Harpax* Terquemi," says it is very numerous around and within the little basins of our "*récif*," (Montabrat) in Normandy.

Taking this prevalence of the species in north and midland France into account, we would contrast with it the fact that it does not seem to be found anywhere else throughout the whole of the continental Lias,—being notably absent from the whole of the Germany Lias; for on referring to the chief authorities of that country we find that Quenstedt does not name it; and Oppel mentions that he only met with it once, and then in France, in the Middle Lias of Fontaine Étoupefour (Calvados): whilst Dr. Brauns, the latest German writer on the Jura (1871 to 1874) assigns to it no place among the German molluscan fauna. In short, we are led to the conclusion that *P. lævigata* is a species which, throughout the Middle Lias of the Rhone, is but sparsely distributed, except at the two points before mentioned, namely;—at St. Fortunat by the foot of Montout, where it forms an entire bank, and at Givérdy, where it is to be counted by thousands. These with the third locality, namely:—about the Montabart reef (Calvados), give us apparently its local centres; or to express the case more precisely, we would state that the three places just cited, furnish good data, whence a true zoological centre of distribution may be ultimately deduced. Thence we may fairly infer, the species was naturally transported to our latitude of the great expanse of Jurassic sea, by migration or by currents following the line of coast. The circumstances connected with the finding this new fossil are a little curious. Whilst working at the Middle Lias beds in a quarry at

Churchdown, I met with two shells that at first glance looked like *Ostreæ*, but which on reaching home, I at once determined to be *P. lævigata*, both of them being left valves, and they were labelled under that name.

I was led to this conclusion by the peculiar foldings of the lines of growth: they were not foliated like those of an Oyster, but were what the French express by the word *contournés*; further, I was more particularly impressed by the peculiar triangular apex of the umbo, both leading characters of A. d'Orbigny's species. On afterthought, and being much influenced by the fact of the very restricted range of this particular fossil, a slight misgiving arose, for I deemed my determination unsafe in the absence of any knowledge of the hinge-area of my specimens. I, therefore, provisionally cancelled the name of *P. lævigatus*, and determined to carefully excavate the shell about the hinge margin of the specimen, which happened to be the left or free valve, never dreaming of the probability of meeting with the right or adherent valve, which would have cleared up the point. Accordingly, I had actually begun to cut away the layers of the shell, when I was forced to leave the work unfinished as the fossil was intensely hard; whilst it was left in this incomplete state, I went by chance some time after toward the quarry where the first examples were found, and the first object my eye detected was the right or adherent valve, with the teeth perfectly exposed, only slightly abraded by the sand-drift of the marlstone; and adherent to a piece of thin-bedded micaceous marlstone of the Middle Lias. Now to shew how rare this valve is, even where the species exist in considerable numbers, I will quote the testimony of those able Palæontologists, M. M. Dumortier and J. A. Eudes Deslongchamps: the former declares that he has only met with the right valve; and the other states that he has never met with it. M. Dumortier says, "Malgré le très grand nombre d'échantillons que j'ai pu examiner du *Harpax lævigatus*, je n'ai jamais rencontré la valve droite, ou adhérente." J. A. Eudes Deslongchamps, "fait remarquer qu'il n'a jamais pu observer non plus que la valve gauche, ou libre, du

Harpax Terquemi; j'ai cependant, réussi tout nouvellement à mettre la main sur une valve droite, ou adhérente, en bon état de conservation, mais de petite taille." E. DUMORTIER, Études Palæontol. III$^{\text{ème}}$ partie, page 313. (Paris, 1869.)

As the occurrence of this species is not only new to the Cotteswolds, but also an addition to the British Liassic fauna, it may be well moreover, to distinctly consider the bearing and import of such additions as from time to time serve not merely to enrich the fauna of a country; but besides, tend to enlighten our view of the whole Jurassic period.

These new forms of life teach us explicitly that the liassic seas that surged and broke against that old reef of Montabart, and filled its sinuosities with rare treasures of marine life, there to be preserved for the delight of the palæontologist, was the same water that was instrumental in depositing the several strata of our Cotteswold Hills, and was obedient to the same tidal wave that rolled over our western Islands, long before our valleys were formed, or ever the Hills were made.

And so to Geologists its import is clearly this, that there is in the wide sense, no English Lias as apart from the Lias of the North West Continent of Europe, but both series of deposits are one, and in their unity are becoming more and more familiarly known to the student as the *Anglo-Parisian basin.* Proofs of this unity are continually multiplying, though really redundant as proof; especially amongst the molluscan fauna of that basin. Passing some of these under review, I will now mention just a few that occur to us, belonging to this interesting group of forms; because they supply striking illustrations of the previous remarks.

How remarkable, for instance, is the *Trigonia Lugdunensis,* from Langres in the deposits of the Rhone valley, the oldest known true *Trigonia*;* first discovered in this country by Prof. RALPH TATE, (Geol, Magaz. 1872, p. 306) in the Middle Lias of Cleveland, Yorkshire, in the Spinatus zone; after that occurring further south; and lastly, found still further south by the late Miss BAKER, at Preston Capes, in Northampton.

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* See, Études Critiques sur les Mollusques Fossiles, par L. Agassiz, Neuchâtel, La Suisse, page 2.

May not the workers of the Cotteswold Club, keep an expectant eye upon it? *

Next, the large Liassic species of *Tancredia*, (Lycett, 1850) of which the French possess so many, are now beginning to come to light. Referring to the 2nd. Edition of Morris (Brit. Fossils, 1854), all inserted in his list of the genus are Oolitic; not a single species from our Liassic older beds: now one species in particular—the rare *T. liassica*, (Etheridge) was found in the Lower Lias by the Rev. J. E. Cross, in Lincolnshire ("On the Geol. of N. W. Lincolnshire," Q. J. Geol. Soc. May, 1875); and by myself a little while before, in the Margaritatus-Zone of the Middle Lias, at Churchdown. Further, the subject of this paper, the *Plicatula lævigata* of the Normandy and the Rhone Basin deposits, being yielded by the Cotteswold Lias, points to the same conclusion. Not to mention several new species of *Brachiopoda* common to both series, the evidence does not culminate in the mollusca; witness the singular little crinoid, so frequent in the Calvados; the *Cotylederma*, cited by Quenstedt as occurring at Aselfingen: by Deslongchamps, at Mays: and by Terquem, along the Moselle, and now found by F. D. Longe, F.G.S., in the south-west of England, at Down Cliff; and tersely described by our Vice-President, Dr. Wright, in the Geol. Mag. (Oct. 1875)

These facts are cited as examples that sufficiently indicate the drift and significancy of the accession of new fossil forms of a common kindred, that were formerly regarded as aliens to our Liassic fauna.

The description, representation, and other particulars of the *P. lævigata* that follow, are given for the purpose of enabling observers to recognize this new species, by a knowledge of its leading characters; for there is reason to expect, that on the same geological horizon at other points of our Cotteswolds, additional specimens may occur, when their exact localities should be recorded, in order to complete our knowledge of the true range and distribution of the species here introduced.

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* My remark has been anticipated as far as the *Tancredia Lugdunensis* is concerned; for Mr. E. B. Tawney, the Curator of the Bristol Museum, tells me that in the Museum Collection there is a specimen of it labelled "*T. Lugdunensis*, Dumbleton," in the handwriting of my friend Mr. Etheridge. So that we may, it seems, already claim it as our own. This singular instance should stimulate the Members of our Society to keep a sharp look-out in the Cotteswold Lias for other examples of this Rhone species.

SYNONYMS.

Plicatula lævigata, d'Orb. sp.

(Gen. *Harpax,* PARKINSON, 1811. DESLONGCHAMPS, 1858.)

1850. A. D'ORBIGNY, *Plicatula lævigata,* Prodrome étage liasien, No. 216.

1857. E. DUMORTIER, *Plicatula lævigata.* Notes sur quelques fossiles. Lyon. 1857, p. 5, Pl. 2, fig. 2. Pl. 3, fig. 1, 2, 3.

1858. J. A. EUDES DESLONGCHAMPS, *Harpax Terquemi.* Essai sur quelques plicatules fossiles. Mém. de la Soc. Linn. de Normandie, Caen, 1858, p. 29—143. Pl. 7, fig. 11—15

1869. E. DUMORTIER, *Harpax lævigatus* (d'Orb. sp.) *Etudes Palæontologiques* (iiième partie) p. 312, pl. LX, fig. 9 10.

DESCRIPTION.

Shell large, ovately oblong, always more or less oblique; attached by umbo of right valve; test not very thick for its size; surface often in bosses, much depressed. The shell possesses lamellated folds rounded on their edges, the plates overlapping each other so as to leave free, successive zones, of from 2 to 6 millimètres in width, bounded by very irregular concentric lines of growth; these layers easily exfoliate, and it is difficult to obtain in a perfect state that part of the shell which is near the umbo; the part toward the apex of the shell is less rugose, the lines of growth closer, and the contour neater. The apex forms a small triangle, terminating in a very acute angle, which usually, during growth, tends a little to the right; a character rather remarkable in a shell so large, but unfortunately, a character which one has rarely an opportunity of observing.

It rarely or never preserves a trace of the body to which it was attached, though specimens have been found in which impressions of the ribbing of *Pecten acutiradiatus* were apparent. The hinge of the left valve presents, under the umbo, the same elongated triangle whose apex extends to the external contour, and is formed by two salient ridges, which bound the ligamental cavity. This triangle is bordered on each side by a deep striated cavity, and there follow two strong divergent lateral teeth, which in the adult state are finely crenulated on their inner margins, being covered with regular sharp transverse striæ, which it is rare to meet with in good preservation.

The adductor scar which is situated against the posterior margin and at a little distance from the hinge, is oval, transverse, strongly marked, and rarely depressed. The pallial sinus is simple, and follows the external contour at a distance of from 12 to 15 mm.; coalescing with the muscular impression on the left, and forming a contour which embraces the whole of the scar. The hinge plate in each valve is transversely striated. The crenulation of the teeth is not seen in the young state; one of my specimens shews these markings, and is therefore a full-grown individual. The left valve in one specimen also indicates the possession of colour markings, of a dark violet tint.

The dimensions of our specimens are, $\begin{cases}\text{length 80 millimètres.}\\ \text{breadth 65 \quad ,,}\end{cases}$

GEOLOGICAL POSITION,
&c.

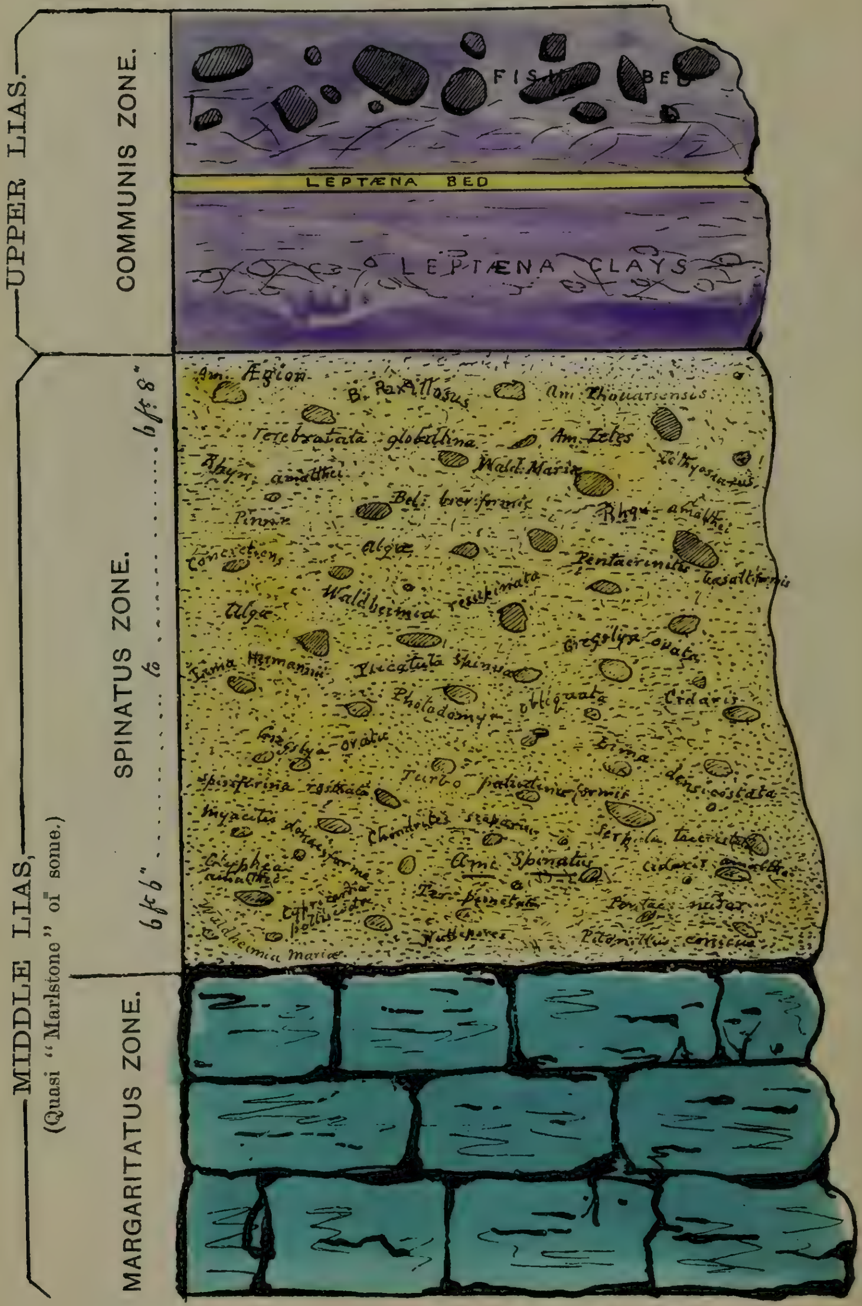
P. lævigata is found both in France and England on the same geological horizon, namely, in those upper beds of the Middle Lias, designated by QUENSTEDT, Lias δ (lower part), and otherwise generally known as the Margaritatus zone of the M. Lias. It is recorded with certainty as only having been obtained hitherto from Churchdown near Gloucester, where it was found last year by the author. One specimen of the left or free valve has been presented by him to the Museum of Geology in Jermyn St., London; the other, the right or adherent valve, he retains; and would have pleasure in shewing it to anyone who takes an interest in the subject.

EXPLANATION OF PLATE.

a. The left or free valve of *Plicatula lævigata.* (d'Orb.)
b. The right or adherent valve of the same.
c. The profile of the free valve.

(All of natural size.)

MIDDLE AND UPPER LIAS.



CHURCHDOWN HILL.

On the Middle Lias of North Gloucestershire. The Spinatus Zone;

by FREDERICK SMITHE, M.A., LL.D., F.G.S.

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I. INTRODUCTION.

Churchdown is well-known as a hill of circumdenudation, and on that account presents the geologist with an example of the adjacent hill country. We possess in it, a typical relic of those layers of strata that once stretched across the vale country, in certain directions as far as the eye can reach. In confining my remarks to the Middle Lias, I would observe that what constitutes the special value of this hill for the liassic geologist, is not its massiveness, for it is only some 580 feet above sea level, but its unity and completeness geologically, so far as the Middle Lias is concerned. There has been no disturbance of the sequence; since as the area of deposit gently subsided, the sediments arranged themselves in a tranquil sea. All, but the youngest stages of the Lias, as the Jurensis Zone or Mitford Sands of some authors, are present; each zone or phase of life of the period being characteristically represented. We say all but the Jurensis Zone, *et supra*, because there is reason to believe that all the younger jurassic beds that capped the hill were planed off, through the same depressing cause, namely, a faulting of the strata that more or less affected the integrity of all the outliers of the vale, and Bredon Hill more particularly.

The *Spinatus* Bed of Oppel, Wright, and other authorities forms the uppermost Zone of the Middle Lias; it rests upon the *Margaritatus* beds, and is overlaid by the shales of the *Communis* or *Bifrons zone,* with its *Leptæna* band and clays, which the author first brought to light in Gloucestershire in 1860, all these belong to the Upper Lias system. One question important to broach at the outset, is this—whether the succession of beds called the *Spinatus Zone* is to be included in the Upper or the Middle Lias, as opinions vary on the point. To clear up this, must be my plea for dwelling so much in my treatment upon minute details. An examination of the lias in reference to this substage of life, will bring out the following particulars, namely, that where as in the North Cotteswolds, the sediments appear to have been deposited without serious disturbing influences, the *Spinatus Zone* is clearly marked off by its palæontology. In other regions, where the deposits are schistous, contorted, or irregularly faulted, as they are in Germany;—in Hanover according to Seebach, and in Brunswick according to Emerson or Brauns; and again in France where they show but feebly, owing to similar disturbing causes* there such authors are unable to distinguish, and do not admit this zone to be a distinct substage of the Middle Lias.

On the other hand Dr. Oppel in his Jura formation explains that in the Suabian provinces the *Spinatus Zone* can be fully established. Another equally accurate and trustworthy authority, Dr. U. Schlönbach vouches it to be for North West Germany a zone clearly distinct; for his discussion of it see *Zeitschrift der Deutsch. geolog. Gesellschaft,* Berlin, 1870.† Returning to the French Lias the strata do not seem to be easily separated, either by M. Dumortier in the deposits of the Rhone district, to the South and East, or on the North West of France by the M. M. Deslongchamps. But we must bear in mind that their Middle Lias occurs in positions that must totally preclude all ordinary littoral conditions—fringing as they do, upturned Cambrian and granitic rocks, we must therefore omit the contents of these *recifs* as they are named, from our consideration; they afford us little light and scant support, stratigraphically. So that such continental authors, must continue to designate this portion of the lias by the name of *Amaltheenthone* or Upper *Margaritatus* Beds or Zone of *Pecten æquivalvis,* or as in Cérnes, the *Marnes à plicatules.* In this state of the subject, we may well inquire what is the significance and testimony of our North Gloucestershire beds in their bearing upon the question. A thorough and patient examination of them brings out the fact that they directly support the view which postulates the existence of a *Spinatus Zone.* Our Churchdown Sands were no doubt laid without interruption within the protection of a quiet coast line, and this advantage connected with the fine character of the filmy marly sediment conduced to render them well adapted to receive and transmit to us the representative forms of life of that liassic epoch. The testimony then of this portion of the Cotteswolds hills and outliers, is when carefully interpreted unassailable. This witness is mainly from the palæontological side of the question. Moreover, the difference between the petrology of the *Spinatus Zone* and the *Margaritatus* Beds is of a marked character. We are, therefore, fully justified in concluding that the Middle Lias of the Cotteswold for North Gloucestershire in regard both of its fauna or assemblage of life, and its petrology, is in favour of such a subdivision as the *Spinatus Zone,* which now we will proceed to examine more closely.

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* See A. D'Archaic. Hist. des Prog. de la Géol, tome VI. p. 444, Paris 1854.

† Also "Ueber den Eisenstein des mittleren Lias im N. W. Deutschland Berlin, 1863. I have also consulted "Die Schichtenfolge des unteren und mittleren Lias in Norddeutschland, 1863," by the same author.

II. SYNONYMS OF THE SPINATUS ZONE.

We would usher in our list of some of the chief names that have been given to the Spinatus Zone, by directing attention to a distinction in the application of the word Synonym. When applied to fossils, these countless designations, though unfortunately a necessary evil, are a hindrance rather than a help. But when applied to groups of strata homotaxially, situated, a list of the chief synonyms judiciously selected from the best authorities, gives when read aright, the following clue:—

They indicate in a way more or less general, the striking peculiarities of the strata or groups at different remote points: variations of petrology; the predominance of particular fossils; their presence or absence; whether a shore or deep sea deposit, &c., thence we can in a measure infer something real as to their horizon and range. Synonyms may in this light be regarded as in some degree, formulated expressions employed to qualify and distinguish subdivisional groups of strata.

ENGLISH.

	Names.	*Authors.*	*Localities.*
1815	Blue Lias Marl (pars supra)	W. SMITH	England
1822	Upper Marls	CONYBEARE AND PHILLIPS	England
1823	Micaceous Marl	DE LA BECHE	Dorsetshire
1845	Marlstone (pars supra)	MURCHISON	Gloucestershire
1858	Ironstone series (pars supra)	PHILLIPS	Yorkshire
1863	Spinatus bed	WRIGHT	South of England
1875	Spinatus Zone	JUDD	Rutland
1876	Zone of Ammonites Spinatus	TATE AND BLAKE	Yorkshire

GERMAN.

1836	Schichten mit Am. costatus und Turbo cyclostoma	F. A. RÖMER	North Germany
1843 to 1856	Costatus kalk Amaltheenthone Lias Delta	QUENSTEDT	Würtemburg
1853	Region des Am. costatus	OPPEL	South Germany
1856	Die schichten des Am. spinatus	OPPEL	Suabia
1860	Horizont von Am. spinatus	WAGENER	Falkenhagener
1863	Zone des Am. spinatus	SCHLÖNBACH	North Germany
1870	Schichten des Am. spinatus	EMERSON	Luithorst
1871	Die Amaltheenthone (pars supra)	BRAUNS	N. West Germany

FRENCH &c.

1846	Marnes à plicatules	MARCOU	Jura salinois
1857	Calcaire à Am. spinatus et Gryphée cymbium	MARCOU	Burgundy
1846	Calcaire à Gryphée cymbium	COTTEAU	Côte d'Or, &c.
1854	Macigno d'Aubange	DEWALQUE ET CHAPUIS	Luxemburg & the Moselle
1860	La Zone à Ammonites spinatus	DESLONGCHAMPS, FILS	Calvados
1869	La Zone à Pecten æquivalvis (pars supra)	DUMORTIER	Lyonnais

CORRELATION OF MODERN DIVISIONS OF UPPER AND MIDDLE LIAS, TABULATED.

Authors and Dates.	Tate & Blake 1876.	Oppel modified by Wright 1869.	Schlönbach 1863.	Wägener 1860.	Brauns 1871.		Dumortier 1869.	
Localities.	Yorkshire.	Glo'ster-shire.	North Germany.	Falken-hagen.	North West Germany.		Lyonnais.	
UPPER LIAS.	Zone of Am. Jurensis.	Zone of Am. Jurensis.	Zone des Am. Jurensis.	Horizont von Am. radians.	Die Mergel des Am. Germaini.	Falciferen Zone.	Niveau de la limea acuticosta.	Zone de Pecten æquivalvis.
	Zone of Am. Communis.	Zone of Am. Communis.	Zone des Posidonia Bronni.	Horizont von Am. Walcotti.	Die Posidonien schiefer.			
	Zone of Am. Serpentinus.						Niveau de l'Ostrea sportella.	
MIDDLE LIAS.	Zone of Am. Annulatus.							
	Zone of Am. Spinatus.	Zone of Am. Spinatus.	Zone des Am. Spinatus.	Horizont von Am. Spinatus.	Die Amaltheenthone.		Niveau du Tisoa* siphonalis.	Zone de la Belemnites clavatus.
	Upper Zone of Am. Margaritatus.	Upper Zone of Am. Margaritatus,	Obere Zone des Am. Margaritatus.	Horizont von Am. Amaltheus.			Niveau de la lingula Voltzii.	
	Lower Zone of Am. Margaritatus.	Lower Zone of Am. Margaritatus.	Untere Zone des A. Margaritatus,—oder obere Zone des A. fimbriatus.				Niveau du Tisoa siphonalis.	
	Zone of Am. Capricornus.	Zone of Am. Capricornus.	Untere Zone des A fimbriatus.	Horizont von A. Capricornus, major maculatus.	Die Schichten Des Am. Davæi.		Niveau du Belemnites paxillosus.	
	Zone of A. Jamesoni, & region of Am. armatus.	Zone of A. ibex & A. Jamesoni.	Zone des Am. Jamesoni.	Horizont von A. striatus	Die Schichten des A. centaurus. Die Schichten des A. Jamesoni.	Capricornum schichten.	Niveau de l'Am. armatus.	
Lower Lias.								

For the sake of utility we here have placed in exact juxtaposition the chief subdivisions of the more recent systematists, in the Upper and Middle Lias. *The Tisoa siphonalis of Dumortier is a problematical fossil found in the Middle Lias of the Rhone frequently, but its nature has not yet been determined.

BOUNDARY BEDS OF THE MIDDLE LIAS AGAINST THE UPPER LIAS, CHURCHDOWN HILL, GLOUCESTERSHIRE.

[6 FEET TO THE INCH.]

	Unrepresented at Churchdown.	ZONE of *Ammonites Jurensis.*	UPPER LIAS
	Alluvium Brown Marly Clay Yellow Geodes of Argillaceous Limestone. (Fish bed) *Leptolepis concentricus.* &c.	ZONE of *Ammonites Communis.*	
Leptæna Clays	Mottled Blue and Drab Clay with Crustacea. *Leptæna Band with peculiar Fauna.* (Fredk. Smithe, 1860.) Brown Marly Shale. Blue and Yellow Clay.		
		Frontier Line	
	Fine Yellow Marly Sands reposing upon Rock Bed. (*Lamellarian Shoal.*)	ZONE of *Ammonites Spinatus.*	MIDDLE LIAS
Marlstone of the older Geologists.	(*Rock Bed* of Quarrymen.) A Dark Blue Olive impure Limestone, compact. Blue in Middle, and weathering to Red Brown. " *Belemnite Pavement.*"	ZONE of *Ammonites Margaritatas.*	

III. PETROLOGY.

The uppermost stratum bounding the Middle Lias, which in fact crowns this important division of the Lias formation, is the *Spinatus* sands. These sands, as a whole, form the *Spinatus Zone* of the Middle Lias. The beds of this zonal division in the Northern part of Gloucestershire,. attain a thickness varying from 6 ft. 6 in. to 6 ft. 8 in. at Churchdown an outlier of the Cotteswolds; and in its general character as compared with rocks in the same relative position in other parts of Europe, constitutes a distinct subdivision of the Middle Lias, having its peculiar character, whether regarded as to its fossil contents, or the nature of its petrology. The beds consist of buff-coloured incohering or slightly compacted sandstone of fine grain and marly character, sometimes inclining to a drab tone, more often to a dirty yellow hue, such as artists term a broken yellow, and it is singular that wherever these sandstones occur homotaxially, throughout N. West Germany, they are invariably described as yellowsandstones. The Churchdown Spinatus sandstone contains a small but varying proportion of marl desseminated throughout the mass, which is a fine grained sandstone; and which, as regards hardness, is nowhere sufficiently compacted to be of any service for road metal or building stone. Hence probably the neglect of the material of this division by geologists—for it is never exposed in stacks like the Marlstone on which it rests. The quarries at Churchdown, and generally in the Cotteswolds, are opened for the sole purpose of getting road metal from the rock bed of the Margaritatus zone, and in order to reach this bed, the sandstone of the Spinatus capping must first be removed. The blocks of sandstone removed from the quarry are tilted on one side to be out of the way of the quarrymen, and there the spoil bank can be easily examined, if taken in time, but there must be no delay, certainly not a couple of winters between, as under the influence of rain and frost, they soon present to the eye nothing but a muddy shapeless sand-heap, at least, the softer portions of them, for some of the harder blocks withstanding such agencies longer, present on their cleavage faces numerous interesting weathered fossils of the less delicate kinds, such as large *Belemnites, Pectens,* and *Plicatulæ,* which will be referred to under the section Palæontology of the zone. It will suffice to remark that the predominant lithological character of the Sandstone of the Spinatus zone is *instability.* We now pass from the superficial appearance of the rock, and glance at its embedded lithological contents, such as nodules, rock fragments, and concretions. None of these occur in definite horizontal bands or courses, but are scattered irregularly throughout the mass of the rock. The most remarkable and conspicuous of them, consist of small pieces of dark gray green rock occasionally met with in the light yellow coloured sands. In size they do not generally exceed two or three inches in length, and are rough fragments of irregular shape, much as though struck from the rock by a sharp blow, and are neither water-worn nor abraded. These dark green pieces of rock are of considerable lithological interest. They are doubtless portions of a derived rock, and are thus *remanié,* that is, worked up again. There was at first some ground for supposing these pieces to have been derived from rocks older than those of liassic age; but a more careful examination and rigid testing forces on us the conclusion that their origin was from older Middle Lias rocks, perhaps breakers in a bay, splintered up and washed into the sands by the violent action of a battering ground swell, such as I have oftened witnessed on the iron-bound coast of Brittany and North West France. Now, were these pieces of old rock more abundant, and also cemented together by a siliceous or calcareous medium, instead of lying loosely scattered through the mass as they do, we should properly assign to them the designation of a *breccia.* Their occurrence, anyhow, is peculiar, and I will distinguish them by giving an account of their chemical examination by an experienced physicist of our Society, Mr. E. HOLLAND. Their colour is to some extent due to manganic silicate and the dark green hue of the underlying beds (*Margaritatus Zone*) is due to the same mineral. Mr. HOLLAND at my request, tested these rocks for manganic oxide by means of the spectroscope. He writes "I found a faint re-action of silicate of manganese after blowpipe and spectroscope," and it is certain that the parent rock contains that metal. Manganese in varying quantity is found throughout the whole of the Middle Lias rocks, and it is not a little remarkable that the deep sea dredgings of the Challenger expedition brought to light large quantities of manganese rock from different parts of the Pacific ocean. The next lithological characters of the *Spinatus* sandstone to be mentioned are its concretions, and these somewhat differ from what are generally found disposed in courses through shales and clays. First, there occur masses of mixed character, composed of small crystals of Selenite, grouped around organic remains, such as osselets of the *Belemnite* or other hard fossils; with some ochraceous matter, the whole bound together by hydrated oxide of iron into rough clump-like masses of utterly irregular shape, varying in colour from light yellow ochre to a deep dark red, and, of course, very dense in gravity from the large per-centage of iron in its composition. The concretions proper differ considerably, none are of large size, not exceeding the bulk of a walnut. Many consist of a cream coloured calcareous matter, without a nucleus, these could not have been deposited from a solution of lime, and were therefore particles of lime drawn from the sea water by vegetation. Their immediate derivation is from decomposed nullipores or other marine crustaceous plants belonging to an order found in all parts of the Ocean, and are much more numerous in warm than in cold climates: under the action of a tropical sun, they lend themselves to rapid decay and disintegration. Other small nodules require a notice, as they attract our attention in breaking up the Sandstone. These also are white concretions, irregularly dispersed, but very hard from containing in addition to lime, some siliceous matter and also calcic phosphate. When opened with a sharp application of a hammer, they disclose a hard phosphatic interior of dark smoky colour; which, looked into with a lens, are seen to be studded with tiny white seedlike bodies, of regular oval form; these are microscopic crustacea of the division *Entomostraca*. The white bodies of recent Ostracods when boiled turn red, like the shell of a lobster. It will not be inappropriate to distinguish these nodules of the *Spinatus* sandstone by naming them "*The Entomostraca Nodules of the Spinatus Zone.*" The careful examination of the lithology being all important, the mode employed in our case was as follows: first an examination in the *dry* way was effected. A small portion of the sandstone was cautiously reduced to powder, without crushing the particles composing it; the powdered substance was next passed through gauze sieves of different fineness of mesh, and thus were the constituents of the rock properly separated and prepared for examination with the lens.

A very correct diagnosis of a rock may thus be obtained. In this instance the result that was ascertained was briefly this: that the main basis of the sandstone was a yellowish calcareous mud of fine composition, with a few siliceous particles of diatomacean origin, that would barely impart a polish to a metal surface; whilst, on the contrary, the remaining constituent in order of coarseness proved to be grains of *hyaline* quartz, that had sufficient cut from angular surfaces to attack and speedily polish iron or steel. These marly sands may be referred to the same class as the Bridgwater bay sands (West Somerset), of which the scouring bricks known as Bath bricks are composed. Therefore as it is a pleasing office to the geologist, to suggest an economic use for such substances afforded by the earth, yet rejected as effete and worthless by mankind, I would recommend the use of these sands of the *Spinatus Zone* as a good scouring material. To the farmer, they would prove an excellent dressing stimulus to old worn out clay soils, improving their impervious character, and reviving their fertility by the accession of such fertilizing matter, as phosphoric acid, lime, and finely divided silex, all ingredients grateful to vegetation. The chief drawback being that like the iron ores of our Middle Lias, there exists no considerable quantity of it, and besides, on the top of a hill, it is difficult of access. Throughout the whole of the *Spinatus* sandstone, which corresponds to the "Iron series" of the Yorkshire Lias, the ferric oxide is freely distributed in stains, veins, and lumps. The larger quantity of iron deposit is found in order of time to have its source in the under zones of the M. Lias, such as the *Margaritatus* and *Capricornus* Beds, and the Spinatus *ferruginous* matter was doubtless drawn from the same origin, but in a less marked degree. There is comparatively a smaller quantity of iron-ore in the *Spinatus* beds, but still a very perceptible quantity that came, like that of the under zones, from the prodigiously lavish vegetation of the ancient seas. Besides examining the rocks of the *Spinatus Zone* by the *dry* way of procedure, they were also submitted to the *wet* process. A small portion of the powdered substance obtained as before described, was tested by boiling in hydrochloric acid, washing out the acid and drying the powder. Looked into with the lens, and also within the field of a low objective, a portion of the basis of the rock was clearly shown, consisting of small white grains of a fine glassy quartz, the fine glassy variety called *hyalite*, and the yellow colour of its associated particles we infer was that of the iron film coating these quartz grains, and the particles of kaolin from the broken up alkaline felspars, so that this, with the particles of white mica spangling in the rock yield to demonstration the complete elements of a granite rock. And we would add, that the *fine* character of the grain of a sandstone, according to the best hydrographers, is dependent on situation. In our case, subject to this ruling, the stone would be that formed on the low tidal level of a coast line and in the sheltered recesses of a cove or bay. We conclude then that from mineral evidence alone, these sandstones were the product of the destructive agency of the liassic sea, exerted in a creek or bay of the sea-shore upon granitic rocks or their derivatives. The corroboration of this result will, if necessary, be given in the section on the palæontology of the zone. It is not unworthy of notice, that the recent deposits on the coasts of the Anglo-French basin both in shore and more to the open sea, partake of this character of our Spinatus sandstone, inclining to an absence of the hornblendic element, and the presence of comminuted hyaline quartz, and white mica, with black mica only occasionally. Also the usual felspathic residuum of clays, separated from the sands and forming the ooze of the sea bottom. Then the alkalis released by the decomposition of the felspars, chemically affect the calcareous matter, and naturally lead us to give a paragraph on the subject of marl.

Marl.—Since Marl and Iron enter so largely into the newer beds of the Middle Lias, we incline to devote a paragraph to the former, reserving the latter for the subject of the *Margaritatus Zone*. The word Marl is used in various popular senses. We mean by it "a friable earthy variety of calcite, containing a variable proportion of clay." The marl incorporated with the *Spinatus* sands derives its argile from the decomposition of the felspars of the gneissic or granitic rocks, which the force of the ancient liassic sea was ever grinding down. Disseminated more or less generally through the *Spinatus* sands, we see finely divided white mica, due to the destruction of the same plutonic, or it may be to metamorphosed rocks; the mica seems unaltered except in the degree of trituration it has undergone. Whilst the calcareous ingredient of the sands might be not only drawn from the sea-water itself, but also indirectly from the finely comminuted state of shells, crinoids, polypidoms and foraminifera, which were so freely dispersed through the mass of sand, and lent themselves in that state, of course after their emerging from the sea, to the action of acidulated rain-water. Our view would regard this ingredient in the aspect of a fresh-water marl. Nature though is very complex in her operations, and does not restrict herself to the exertion of single forces or modes of action. The water then that percolated so easily through these loosely cohering sands after their emergence, attacked, dissolved and in obedience to thermal and chemical conditions, redistributed the lime either in the form of concretionary calcite, or else in mechanical combination with the argile of the sands, thus forming a true marl. These remarks though general, are pertinent to the topic, in consequence of Marl and Lime constituting such important elements in the petrology of nearly the whole of the Middle Lias deposits. Going from the Marl, a word upon the other constituent is this, that the calcareous element seemed to have increased, as far as the Jurassic formation is concerned, and to have attained its *maximum* in the Great Oolite period. This I believe to be due to the Coral sand, and, besides, to the enormous increase of the calcareous encrusted vegetation of the ancient seas, paralleled by what we can now observe in the Carribean sea and Leeward isles, and if we need a further key to the problem, we may observe a similar Oolitic formation, both as to percentage of lime and roe-like structure being silently yet surely constructed at the present day, in the seas of the *Antilles.*

IV. PALÆONTOLOGY.

(1.) General.—The evidence afforded by the palæontology of the *Spinatus Zone* strongly bears out the statement of the last paragraph, that we here possess an example of an old sea-bottom of the mid-liassic epoch; and also that we are justified in assigning to it a definite position in the scale of depth. It formed a shelving shore of the division, named by Professor Forbes the *Laminarian Zone,* which would be about fifteen fathoms deep from sea level. This position is shewn by two distinct but associated groups of fossils. The first class of fossils would be the marine vegetation. On carefully cleaving some of the more fissile sands, and separating them along their planes of deposition, the eye is presented with a varied surface strewn with elongated cylindrical, but more often ovate stems, lying in disorder, either branching from a main stem, of undefined length, or else crossing and recrossing each other. Now, as these sands have scarcely any plasticity, they yield but inferior casts of delicate objects. The impressions are, therefore, hard to interpret;—and, from the absence of delicate markings, the knowledge derived from them must of necessity be rather general than specific in character. Beside the broader impressions or casts, and amongst them, occur undefined patches or blotches, orange-coloured from ferric oxide, and resembling the laciniated fronds of some cryptogamic plants. Their nature is unquestionable. They are the stems and other remains of algæ of the olive-group, which embraced the great sea-tangles. The stems are, where preserved, coriaceous in substance, showing no mid rib, and only a blurred outline of organs of fructification. These particulars harmonize with my first account, and the evidence of them taken together is amply sufficient to lead us to place the depth of the *Spinatus* beds in the *Laminarian* division of the liassic shore. Those desirous of more precise information of the character and dimensions of our larger recent marine algæ, should refer to the works of the late Professor HARVEY. In his Manual of Brit. Marine Algæ, p. 27, (Van Voorst, 1849,) my friend says of the order *Laminariaceæ*, "The plants of this family are almost all of large size, and many of them gigantic, greatly exceeding in bulk any other marine vegetables. The oar-weeds and tangle of our own coasts have frequently stems six or eight feet long, and fronds expanding from their summits to as great a length; and the seathong (Chorda) often measures 40 feet in length. But these dimensions are small compared with their kindred on the shores of the Pacific Ocean. The *Nereocystis* a plant of this family, inhabiting the north-western shores of America, has a stem no thicker than whipcord, but upwards of 300 feet in length, bearing at its apex a huge vesicle six or seven feet long, shaped like a barrel, and crowned with a tuft of upwards of 50 forked leaves, each from 30 to 40 feet in length. The vesicle being filled with air, buoys up this immense frond, which lies stretched along the surface of the sea. Here the sea-otter has his favourite lair, resting himself upon the vesicle, or hiding among the leaves while he pursues his fishing. In length it is exceeded by the *Macrocystis*. In *Macrocystis*, the stem branches, as it approaches the surface, and afterwards divides by repeated forkings, each division bearing a leaf, until there results a floating mass of foliage some hundreds of square yards in superficial extent."

The only palæontologist who has devoted himself to the special study of liassic Algæ is the Count GASTON de SAPORTA, of Aix, who is now bringing out a work on the fossil Algæ of the Jurassic seas. They are, from their nature, and the imperfection of specimens, a difficult class of fossil to study. The predominant form in these Churchdown fossils bear a close likeness to a genus figured by Dumortier, in his *Études Paléontologiques du Bassin du Rhone*, under the name of *Chondrites scoparius.* I have, however, submitted tracings of my drawings and descriptions of the Algæ to the Count G. de Saporta, who has kindly taken up the subject, and corresponded fully with me; but as the results are not yet mature, and the subject is somewhat complex, I would entertain the hope of devoting a separate article to it for the Proceedings of the Cotteswold Society. Meanwhile, the name *Chondrites scoparius*, *Dumortier*, may be accepted provisionally. I add *provisionally*, for after reading Count G. de Saporta's treatise in the Bulletin of the "French Geological Society," one learns, that in his opinion *Chondrites scoparius* is a term of vague general application to this class of fossil, and, therefore, probably applies to several species. Later on, for at the time of writing this account I had not enjoyed the advantage of consulting Tate and Blake's work on the Yorkshire Lias, (Van Voorst, 1876,) I find those authors make out two kinds of Algæ in their *Spinatus* Beds, to both of which, certainly, so far as general resemblance will carry us, we can match the forms in the Churchdown *Spinatus* Sands. They are given by Professor Ralph Tate under *Plantæ*, p. 474, and are entitled, *Nulliporites furcillatus*, spec. nov. and *Chordophyllites cicatricosus*, spec. nov. The latter is stated to be abundant, and like ours, overlapping and intertwining one among the other.

Amongst the exuviæ buried in the sands there are fragments of most orders of marine life. There are broken tests and spines of several species of sea urchin,—and notably, of the *Cidaris amalthei*, Quenstedt. Of the remains of the larger crustacea, the condition of the specimens does not favour a safe determination. There are portions of *Glyphæa amalthei*, and the carapace of a *Pseudoglyphea*, also *Eryma lævis*, *Blake*,—*A. lævigatus*, Simpson. I am much indebted to the ripe experience of Mr. H. Woodward, F.R.S., of the British Museum, for the assistance he is always so ready to afford to students of this class of invertebrate life. We next observe the smaller crustacea, the *Entomostraca*. These are of the minute order

Ostracoda, and mostly found, and in no scanty number, embedded in the nodular concretions, fitly named after them, *the Entomostraca nodules.*

These tiny crustacea have as associates numerous other *microzoa*, and measure in length 1.5 mm. by 1.0 mm. in width. We would observe in passing, by way of comparison, that the largest specimen of *Ostracod* known, was brought home last year from the Challenger expedition, dredged from a depth of 16,000 fathoms in the South Indian Ocean. Its length was 22 mm. by 16 mm. wide. My friend, Professor RUPERT JONES, of the Sandhurst Staff College, kindly examined the Churchdown species. In his report, he says—"That he has been too busy to do more than give *generic* accounts of those I mounted for determination. He finds *Cyprides, Cythrellæ,* and *Cytheræ,* and adds, that they are most interesting in every point of view, that he is going to have some of them figured to aid him in a more vigorous determination, and recommends me by all means to go on collecting from these *Entomostraca nodules.*" I am also kindly promised help in working them out, by Professor HUGHES, F.G.S., of the Woodwardian Museum, Cambridge, so that for these results we must patiently wait. The *Crinoids* must next be treated on. They abounded in liassic seas, but generally flourished on a deeper sea-bottom than the *Spinatus* sands occupied. Legions of the *ossicula* of Pentacrinites with like remains, rich and rare, drifted from other depths and lodged in the tangle banks of the *Spinatus Zone.* Of the dismembered *Crinoids,* some which I have entered in the general list of the *fauna,* have hitherto been scarcely known, if at all, to English science, such as the *Pentacrinites placenta, P. subteroides,* QUENSTEDT, and many varied forms of *P. basaltiformis.* One of them, the *P. nudus, Schlönbach,* is simply a smooth variety of *P. basaltiformis.* Lastly, among other organisms that inhabit these sands are some of more significance, as they confirm our view that the position of the *Spinatus* sands was in the *Laminarian Zone* of depth. These are univalve shells lying on and among the seaweeds. On the cleavage surfaces, and lying among the stems of the Tangles and other *algæ* before mentioned, are hordes of

Gasteropoda of the *holostomata* or vegetable feeders; they are stationed on their natural feeding-ground, the great sea tangles and other broad-leaved plants of the *Laminariaceæ.* These shells are further described under the section *Gasteropoda.* Altogether, the proofs from petrology and palæontology accord, to clearly make out the nature and position of the Churchdown beds, namely, the sands of the *Spinatus Zone.*

(2.) SPECIAL PALÆONTOLOGY (Molluscan).—(*a*) *Cephalopoda. Nautili* are rare in these sands; the specimens we possess are the *Nautilus aratus* DUMORTIER, and the *N. intermedius* of SOWERBY: on the contrary, the *Ammonites* of the zone are fairly distributed as to number, though of comparatively few species. The shells of the *radians* group now begin to come in as it were, for the first time, indicating, most probably, a break in the deposition of the beds. Both *Amaltheus spinatus*, and *Harpoceras Normanianum*, occur often in the form of casts, the shell having been dissolved away since the upheaval of the beds, neither *A. margaritatus* nor its varieties have been secured; though had it been found, its significancy would be little, as the geologist does not expect to meet in nature with the sharp lines and rigid treatment that he does in books. The new forms that now begin to present themselves, belong to the *Falciferi*, and of the type *radians.* Of the specimens that must be referred to this class of the *Ammonitidæ*—first there is *Harpoceras Normanianum*, which through its peculiarity of serpentine ribbing, was originally named "*radians amalthei.*" Other species found in the *Spinatus Zone* are *A. Zetes*, and *A. Thouarsensis* of A. d'ORBIGNY, as well as *A. Ægion*, or *A. Actæon* of the same author; all of these partake of the intermediate form between *Phylloceras heterophyllum* and *A. radians.** The specimens are frequently imperfect, and many of them young. But a good example illustrating the intermediate degree at this stage is to be seen in the collection of the Gloucester Museum, labelled *A. amalthei spinatus*, QUENSTEDT. The difficulty felt in exactly defining this border class of delicate gradation of character so brought before the observer, at the frontier of Middle and Upper Lias, has led Continental authors to have recourse to the expedient of binomial naming, a practice claiming but slight advantage, and attended with many drawbacks. Another *Ammonite,* tolerably common in the *Spinatus Zone,* existing chiefly in casts and impressions, is *Lytoceras lineatum,* a different shell altogether from *Lytoceras fimbriatum* with which some have confused it. The latter is found with us, distinct enough, and quite toward the basement of the Middle Lias. Further notes on the *Ammonites* are given in part VI.

**Ammonites Aalensis*—again, is the link between Am. Radians——and——Am. Opalinus of the Lower Oolites.

When we come to deal with the Dibranchiate *Cephalopods,* we of course in a littoral deposit, expect to find them in strong force. The Belemnites have been engulfed by shoals at a time in these sands when agitated by devious currents, and have left their innumerable osselets to testify their former existence. Unlike the *gasteropods* that glided about the surfaces of the sea-fronds, these examples are of considerable size as to length and thickness, the remains of sea-going adult individuals that perished in a storm drift of quicksand. Were time devoted to the large collection that could be made of these fossils, many more species might be made out. It will suffice for our purpose to select a few only of the better known, principally those described in Prof. PHILLIPS's monograph on the British *Belemnitidæ* (Pal. Soc. 1865). One specimen collected here is unlike anything figured or mentioned in this work; but we will not yield to the vanity of basing a new name on a single specimen. In the opposite degree as concerns number, we cite *Belemnites paxillosus* in its numerous varieties. These fosssils swarm throughout the sands. *B. paxillosus* was named *B. piger* by that old worthy, Dr. LISTER, on account of its dark colour. Here also we have collected the species *Belemnites opalinus,* QUENSTEDT—so designated from the opalescent milky colour of the conotheca and guard. These names are curious; the older palæontologists were not unlike the earliest navigators, who ventured not out of sight of land; all their marks of distinction were drawn from colour or lithology. The short thick forms like *B. breviformis, and P. brevis,* are frequently gathered from the spoil bank; whilst *B. apicurvatus* and *B. subaduncatus* are scarce. *B. compressus* is also one of the rarer forms. From the large number of specimens of the class available, one would have thought that adherent shells might be expected. Some hundreds of them were collected and washed, in the hope of obtaining booty; but all they yielded proved to be merely numbers of young *Plicatula spinosa*, and traces of *Annelids, Serpulæ*, &c. No *Crania, Discina*, or *Thecidea*: the conditions account for their absence—agitated quicksands prevented these portions of drifted *Belemnites* from becoming the *nidus* of the more delicate adherent genera of *brachiopoda.*

(*b*) *Gasteropoda.*—From the observations made before on the particular Laminarian depth of the beds of the *Spinatus Zone*, we may easily infer the nature of its univalve inhabitants, such as usually people this sub-littoral part of a shore, and subsist on its vegetation. Upon the broad surfaces of the strong coarse, *Algæ* growing here, the herbivorous kinds delighted to pasture. I cannot recall to mind any bed of the Lias, at any rate of the Middle Lias, where gasteropods occur in such numbers; but though they congregate thus, the species are few. The shell, or rather cast, constantly met with and always accompanying the flattened stems of plants, is a Turbo, one of the *holostomatous* class of gasteropod that lived exclusively upon vegetation. Our shell is the *Turbo paludinæformis* (Phasianella) of SCHÜBLER, with the test almost smooth; it is about half-an-inch or more in length, and, as we may suppose from the number of synomyms with which it has been honoured, is a species of rather variant form. It is the *Turbo cyclostoma* of GOLSFUSS and MÜNSTER, and is also figured under that name by QUENSTEDT; it is the *T. cyclostomöides*, and the *T. littorinæformis* of DUNKER and KOCH; the *T. Kochii* of H. SCHLÖNBACH, in his Eisenstein der mitt. Lias, 1863, and of EMERSON, in his Lias von Markoldendorf, 1870; and further, the *T. nudus*, of MÜNSTER, and other authors. Doubtless it is the same species figured by OPPEL, Mittlere Lias, 1853; and we surmise that the shells passing under the name of *T. Kochii, T. nudus*, and *T. Itys*, by U. SCHLÖNBACH and by EMERSON, in their respective works, are none other than our friend *T. paludinœformis*, of the *Spinatus Zone* of Gloucestershire. To this we supplement the *T. linctus* of Moore, which at first he named *T. nudus*. As we may conclude from the predominant names mentioned, this gasteropod is found throughout the North West German Middle Lias, and nearly always maintains the same horizon namely that here described as the *Spinatus Zone*. The remaining univalves are tolerably well known to palæontology, but exist here in scanty proportion. The *Chemnitzia Blainvillei*, Münster, collected here has not the pyritous lustre which those I have found on the Dorsetshire coast possess, and which is generally known by Quenstedt's name of "*Scalaria liassica*." Another shell, of which I have several examples, is the *Phasianella turbinata*, Stoliczka. Of this species the late Dr. F. Stoliczka says in his work, page 77, (*Ueber die Gastropoden, &c., der Hierlatz schichten:* Vienna, 1861) that a very similar species is described by Dünker, Palæontographia, at page 107, 13, T. 10 f., as *Paludina Krausseana*, from the Lias of Halberstadt. This little shell often occurs with us in well preserved condition, with the test on, which is an exceptional circumstance.

(c) *Conchifera.*—The mineral character of the sediments exercises great influence upon the mollusca generally, and especially upon the lamellibranchiata. In sands such as those under consideration, the marly character is favourable to their growth and development, but only when the bottom is sheltered from tempestuous currents. It is evident, even where sands enjoy a sheltered situation, such as in a bay; there are seasons when they will be agitated by occasional submarine currents. Our best hydrographers have demonstrated that the sandy deposits of a coast are generally found to be full of small-sized dead bivalves. These are the young that have been unable to exist in the vortex of muddy sand when stirred by exceptionally powerful currents. The condition of the fossil lamellibranchiata fully accords with this supposition. *Ostrea cymbium, Harpax Parkinsoni*, and *Modiola scalprum* are all small young specimens. *Modiola scalprum* only an inch in length; whilst large robust *Gresslya, Pectens* and *Pholadomya*,—the latter from deep sea,—

have been washed in from other levels of depth, their usual habitats. The *Plicatulæ* are so frequent that they recall to mind the *marnes à plicatules* Marcou, at Cérnans (Salins) in the Jura. Many varieties, too, of this very changeable genus may be observed, since numerous examples turn up which prove that the future career of the shell is determined by accident. If the spat of the *Plicatula* happen to adhere to a smooth foreign body like a *Belemnite* or *Terebratula,* forthwith it grows up to be free from spines or tubercles. Thus moulded by circumstances *P. spinosa* becomes the smooth *Plicatula sarcinula,* &c., &c., with little or no ornamentation. Under our name, the *Plicatula spinosa,* it is held* that there are two species: our Middle Lias species is the *Plicatula* (*Harpax*) *Parkinsoni,* and the Lower Lias species is called the *Harpax spinosus.* In the former the spines are on one side the attached valve; in the other, the *H. spinosus,* the spines are on both valves, and the shell is larger. I must frankly own that my limited experience does not support this view; for, as to size, our Lower Lias species is smaller than the Middle Lias examples, the *Spinatus Zone* specimens are double the size and, in other respects, the distinction seems to fade before the examination of a large suite of examples. Still the names are given here to incite to further observation. A beautiful little *Pecten* is yielded by the sands; the *P. pumilus*—LAMARCK; the *P. amalthei,* of DUMORTIER, OPPEL, and STOLICZKA. Brauns says it is an Inf. Oolite species, and is very rare in the Middle Lias: it is certainly rare here. Its peculiarities would require a lengthy disquisition. The large species of the *Pleuronectes* division, *Pecten lunularis,* which attains such a fine size in the *Margaritatus Zone,* is rare and small; but there are several species of ribbed *Pectens,* such as are determined and given in the general list of the fauna, as well as *Cypricardia, Cucullæa, Isocardia, Unicardium, Inoceramus,* &c., &c.

(*d*) *Brachiopoda*—For this order of Mollusca, sands or sandy marls, unless firmly resting upon a very tranquil sea-bottom, do not favour their chance of propagation; they can have no safe anchorage; and although strongly represented as to genera in this zone, we incline to believe that many were derived from neighbouring spots, and were drifts, on account of the frequently battered and misshapen condition of the specimens, as though they had been driven at the mercy of the waves. A few of the stronger forms remain uninjured, and of these I have collected perfect series from the young state upwards. Such would be as genera of the division *Clistenterata* the following:—*Waldheimia perforata, Waldheimia indentata, Waldheimia resupinata, Terebratula globulina,* and *Waldheimia Mariæ,* also *Rhynchonella amalthei*; the two latter new to English science. My accomplished friend, Mr. DAVIDSON, F.R.S., &c., having requested me to prepare a catalogue of the whole of the *Brachiopoda* collected by me at Churchdown, which he and the MM. DESLONGCHAMPS and RÖMER unite in declaring an important position palæontologically, I have, accordingly, tabulated them so as to show the true range of the species through the Lias vertically, and will refer to this table which is printed in the Palæontograph, Soc, 1877, in Mr. DAVIDSON'S Supplement, Part II, merely here giving the bare results shortly expressed. The whole number of species of Brachiopoda collected by me from our Lias would be of the *Tretenterata* division, two genera only; and of the *Clistenterata* 32 genera, making a total of 34 genera of *Brachiopoda.* The whole with the exception of one or two from the *Communis Zone,* were sent to Mr. DAVIDSON, and verified by him. Now of these genera, all belonging to the *Clistenterata* division, 19 are found in our Spinatus beds at Churchdown. The absence of genera of the other great division *Tretenterata,* I have sought to account for. Besides these numerical results, it is important to note the range vertically of each species: hitherto I have succeeded in extending the range of some of them: *T. globulina,* and *W. resupinata,* formerly marked in the *Am. Margaritatus Zone,* I have detected in the *Spinatus Zone,* and so forth. The foreign species were sent by me to M. J. EUDES DESLONGCHAMPS, at Caen, who at once recognized them, and hailed the little *Rhynchonella amalthei* QUENSTEDT, as an old acquaintance of his. The more minute *Brachiopods* found by Mr. MOORE in that portion of the Middle

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* J. A. Eudes Deslongchamps, Essai sur les Plicatules fossiles des terrains du Calvados, &c. Caen, 1858.

Lias explored by him in Somerset, could not, from the nature of our sediments, be expected here. The Somersetshire beds correspond physically in their rich yield of these peculiar fossils, to the deposits of May, Feuguerolles, and Fontaine Étoupe Fours, situated to the south of Caen, and to their striking and exceptional position palæontologically I have already alluded.

V. LIST OF FOSSILS.

To render this account of the beds of the *Spinatus Zone* more useful to the student of the liassic geology of our County, simple tables of the chief fossils are supplied; the two general lists are as follows:—first, adopting by the way, the epithet of Prof. Renevier, of Lausanne.

TABLE I. CLASSICAL, OR LEADING FOSSILS OF THE SPINATUS ZONE.

Amaltheus spinatus
Harpoceras Normanianum
〃 Ægion
〃 Zetes
〃 Thouarsense
Turbo paludinæformis
Waldheimia resupinata
Waldheimia Mariæ
Spiriferina rostrata
Apiocrinus amalthei
Belemnites breviformis
Protocardia truncata
Limea acuticosta
Lima Hermanni
Gresslya ovata
Inoceramus striatus

TABLE II. THE MOST ABUNDANT FOSSILS OF THE SPINATUS ZONE.

Amaltheus spinatus, Brugière
Harpoceras Normanianum
Lytoceras lineatum, Schlotheim
Bel. paxillosus
〃 breviformis
〃 brevis
Turbo paludinæformis
Ostrea cymbium
Protocardia truncata
Pholadomya obliquata
Avicula inæquivalvis
Plicatula spinosa
Pecten aquivalvis
Harpax Parkinsoni
Pecten priscus
〃 acutiradiatus
〃 acuticostatus
Lima densicosta
〃 Hermanni
Inoceramus substriatus
Terebratula punctata
Waldheimia resupinata
〃 indentata
〃 numismalis
Rhyn. variabilis
〃 acuta
〃 amalthei

TABLE III. FAUNA OF THE AMMONITES SPINATUS ZONE, GLOUCESTERSHIRE.

REPTILIA.

Saurian, species

CRUSTACEA.

Eryma lævis	(Blake)
Glyphæa amalthei	(Quenst)
Pseudoglyphea (sp.)	(Oppel)
Cypripes (sp.)	
Cytherellæ (sp.)	
Cytheræ (sp.)	

and others not named.

ANNELIDA.

Ditrypa quinquesulcata	(Münst)
Serpula Hierlatzii	(Stolic)
Serpula circinalis	(Münst)
Serpula nodulosa	(Goldf)

ECHINODERMATA.

Cidaris amalthei	(Quenst)
Millerocrinus Hausmanni	(Roem)
Pentacrinus. scalaris	(Goldf)
〃 amalthei	(Quenst)
〃 basaltiformis	(Mill)
〃 nudus	(Schl)
〃 subteröides	(Quenst)
〃 placenta	(Dumort)
Extracrinus subangularis	(Miller)

MOLLUSCA.

CEPHALOPODA.

Tetrabranchiata.

Nautilidæ.

Nautilus araris	(Dum)
〃 intermedius	(Sow)

Ammonitidæ.

Amaltheus spinatus	(Brug)
〃 Engelhardti	(d'Orb)
Harpoceras Normanianum	(Schl)
〃 Aalense	(Ziet)
Harpoceras Thouarsense	(d'Orb)
〃 Zetes	(d'Orb)
〃 Ægion	(d'Orb)
Lytoceras lineatum	(Ziet)
Phyloceras heterophyllum	(Waag)
Stephanoceras annulatum	(Sow)
Rhyncholites (sp.)	

Dibranchiata.

Teuthidæ.

Teuthis Glevensis	(Smithe)

Belemnitidæ.

Belemnites paxillosus (major)	(Schloth)
〃 brevis	(Quenst)
〃 compressus	(Stahl)
〃 breviformis	(Voltz)
〃 opalinus	(Quenst)
〃 apicicurvatus	(Blainville)
〃 cylindricus	(Simpson)
〃 subaduncatus	(Voltz)
〃 inæqualis	(Simpson)

GASTEROPODA.

Holostomata.

Turbo paludinæformis	(Schloth)
Cerithium Blainvillei	(Blainville)
Turbo cyclostoma	(Ziet)
〃 linctus	(Moore)
Pleurotomaria amalthei	(Quenst)
Pitonillus conicus	(d'Orb)
Phasionella turbinata	(Stolic)
Neritopsis lævis	(Stahl)
Eucyclus capitaneus	(Goldf)
Dentalium gracile	(Moore)

CONCHIFERA.

Ceroma bombax	(Quenst)
Anomia numismalis	(Stolic)

Ostrea cymbium	(Lmk)
〃 sportella	(Dum)
Pecten æquivalvis	(Sow)
〃 lunularis	(Roem)
〃 priscus	(Schloth)
〃 acutiradiatus	(Münst)
〃 pumilus	(Lmk)
〃 acuticostatus	(Ziet)
Avicula inæquivalvis	(Sow)
〃 imbricata	(Moore)
〃 calva	(Schlonb)
〃 novemcostæ	(Brown)
〃 papyria	(Quenst)
Modiola scalprum	(Tqm)
〃 ornata	(Moore)
〃 numismalis	(Oppel)
〃 subcancellata	(Brug)
Limnea acuticosta	(Roem)
〃 densicostata	(Quenst)
〃 Hermanni	(Voltz)
Plicatula spinosa	(Sow)
〃 sarcinula	(Münst)
Harpax Parkinsoni	(Brown)
〃 pectinoides	(Lmk)
Tellina fabilis	(Simpson)
Isocardia nitida	(〃)
Protocardium truncata	(Sow)
Pleuromya donaciforme	(Goldf)
Pleuromya costata	(Y & B)
Gervillia ærosa	(Simpson)
Gresslya Seebachii	(Brauns)
〃 striata	(Brauns)
〃 ovata	(Roem)
Isocardia rugata	(Oppel)
Pholadomya ambigua	(Sow)
〃 decorata	(Ziet)
Placunopsis liassica	(Smithe)
Cypricardia pellucida	(Moore)
〃 cucullata	(Münst)
〃 Partschii	(Stolicz)
Cucullea Munsteri	(Ziet)
〃 bilineata	(Moore)
Unicardium Janthe	(d'Orb)
〃 subglobosum	(Moore)
Leda Galathea	(d'Orb)
Leda subovalis	(Goldf)
Gervillia ærosa	(Simps)
Inoceramus substriatus	(Münst)
Opis carusensis	(d'Orb)
Hinnites tumidus	(Ziet)
Arca elongata	(Quenst)
〃 caprina	(Stolic)
〃 interrupta	(Moore)
Pinnæ (sp.)	

BRACHIOPODA.

Clistenterata.

Terebratula punctata	(Sow)
〃 subpunctata	(Davids)
〃 globulina	(Davids)
〃 Edwardsi	(Davids)
Waldhemia Mariæ	(d'Orb)
〃 resupinata	(Sow)
〃 numismalis	(Lamk)
〃 perforata	(Piette)
〃 indentata	(Sow)
〃 subnumismalis	(Davids)
〃 cornuta	(Sow)
〃 quadrifida	(Lamk)
Rhyn. acuta	(Sow)
〃 variabilis	(Schloth)
〃 amalthei n. sp.	(Quenst)
〃 tetrahedra	(Sow)
〃 cynocephala	(Richards)
〃 furcillata	(Theod)
Spiriferina rostrata	(Schloth)
〃 Walcotti	(Sow)

Tretenterata.

None.

ALGALES.

Nulliporites furcillatus	(Tate)
Chordophyllites cicatricosus	(Tate)
Chondrus scoparius	(Dumort)
Laminaria sp.	
Nullipora sp.	

Annelids ; Spongiæ ; and Foraminifera

SECTION OF SPINATUS BEDS
AT CHURCHDOWN; QUARRY ON CHURCHDOWN HILL, GLOUCESTERSHIRE.

Division.	No.	PETROLOGY.	Thickness.	FOSSILS.
			ft. in.	
Ammonites Communis Zone.	1	Alluvial soil, with occasionally drift-Pebbles.	1 ... 6	Teleosaurus, Pterodactylus, Tetragonolepis concentricus, Leptolepis concentricus, Pachycormus, Am. communis, Am. bifrons, Am. annulatus, Am. lineatus, Am. Lythensis, Rostellaria trifida, Turbo capitaneus, T. globulina, R. pygmea, Spirifer Ilminsterensis, Inoceramus dubius, Mytilus gryphoides, Monotis substriata, Leptæna Moorei, Crustacea and Algæ, &c., &c.
	2	Brown marly clay.	2 ... 0	
	3	Concretionary argillaceous limestone (Fish-bed).	0 ... 6	
	4	Mottled blue and drab clays.	6 ... 0	
	5	Brown marly shale (Leptæna Band)	1 ... 0	
	6	Blue and yellow clay.	1 ... 0	
Ammonites Spinatus Zone.	7	Yellow marly sands containing "Entomostraca nodules," and concretions of Ferric oxide, and spathose iron.	6 ... 0 to 6 ... 8	Cidaris amalthei, Am. spinatus, Am. Normannianus, Am. Zetes, Nautilus aratus, Apiocrinus amalthei, Pecten pumilus, Turbo paludinaeformis, Gryphea cymbium, Phasianella turbinata, Belemnites paxillosus, Harpax Parkinsoni, Chemnitzia Blainvillei, Waldheimia Mariæ. Waldh. perforata, Waldh. indentata, Rhynch. amalthei, Spiriferina rostrata, Crustacea, Fucoids, &c., &c.
Ammonites Margaritatus Zone.	8	Marlstone Rock; impure limestone, blue inside weathering to brown; ferruginous, and graduating into thin-bedded marlstone, also highly ferruinous.	10... 0	Am. margaritatus, Am. Englehardti, Nautilus intermedius, Pecten æquivalvis, Pecten lunularis, Pecten priscus, Avicula inæquivalvis, Modiola scalprum Protocardium truncatum, Plicatula lævigata, Gresslya Seebachii, Rhynch. acuta, Rhynch. amalthei, R. tetrahedra, Tancredia liasina. Ditrypa quinquesulcata. Cidaris Edwardsii.

VI. GENERAL REMARKS.

It may now be gathered from the course of my examination of the *nature* and *contents* of this stage of the Middle Lias, what was to a considerable degree of approximation, its position petrographically, and also, the phase of organic life it has transmitted us.

In estimating the former, that is, the natural position of these beds, it was necessary to first make a precise and accurate survey of all the lithological details. This having being done, a careful comparison was next made between these data, and recent similar submarine deposits. Recourse was had for this purpose, to the hydrographical Tables of M. Delesse, that form the second vol. of his admirable work, entitled " Lithologie du Fond des Mers." * From the study of this valuable compendium of actual observations, a work of immense labour, we have been led to carefully form conclusions that may be depended upon. Some of the inferences thus afforded, have been already anticipated in my remarks under the special headings. Still, I will now briefly sum up the obvious deductions drawn from our preparatory work. The positions we arrived at are these:—

1. The beds of the *Spinatus Zone*, were a marine deposit of sub-littoral character.

2. They were protected in a bay, cove, recess, or indentation of the coast line of the liassic sea, for otherwise, had they been entirely unprotected from the race of the tidal waves, they would have contained no molluscan remains; as the unrestrained force of the submarine currents, would have swept out of them all traces of organic life.

3. These beds were formed below the level of the lowest tides.

4. The various fossils obtained from them shew us that their true position was within that littoral division known as the *Laminarian Zone*, which was about 15 fathoms in depth.

5. Judging from the nature and habits of the Mollusca of the Zone, they must have inhabited a warm natural-history province.

There yet remains an interesting inquiry, that which concerns this Zone in its horizontal extent and direction. It is easy to assume the notion that certain beds resembling each other were deposited at the same time, and that their extension was general. It comports better with our phenomena to contend that the *Spinatus* beds were not merely local deposits, but at least so far general in distribution, as to be conterminous with the areas of the basins of subsidence; for during the gradual subsidence of a given area their deposits were formed. It is true that we are working with an imperfect knowledge so far, that these beds have not come down to us in their original entirety. From the instability of their petrological character, we should only expect to meet with dim traces of the original strata, and those only at certain points, where they have escaped denuding forces; from this cause, they have been in some places enormously reduced in thickness, and in others, entirely planed away. But a consideration of the following particulars will convince us, that with certain exceptions capable of deliberate explanation, the persistency of the *Spinatus* beds is somewhat striking. Without generalizing farther on the phenomena, we will proceed to adduce facts; mentioning some of the more considerable places in each country, where the Zone is exhibited.

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* In M. Delesse's work, the tabulated results of his extensive hydrographical observations upon all our chief littoral and open sea accumulations are given with a surprising completeness.

In the Western isles of North Britain, as well as on the Eastern coast, we possess most interesting remains of Middle Lias, which testify to the scattered archipelagic character of the North Jurassic sea. Of the former, the Jurassic rocks of Skye and Raasay, we have fortunately all but a complete account published of these striking Liassic strata.* Only passing notices had been given of such fragmentary deposits since 1819, when Dr. MACCULLOCH's "Account of the Western Islands," first described their true geological structure, until our associate Dr. WRIGHT, by bringing his experience and knowledge to bear upon the fossils collected by Prof. GEIKIE, (Notes, Quarterly Journal Geol. Soc. 1857, p. 24) from the Lias of the Isles of Pabba, Scalpa and Skye, struck the true note that led to that harmony and true correlation, for which we are indebted to our present clearness of view of the North British Lias. Up to this date, 1858, the portions of Lias ascertained to exist, embraced the Lower Lias, and the lower beds of the Middle Lias. Dr. Bryce now supplements that amount of knowledge by further researches undertaken in 1869 and the three following years, and his observations as rendered in his account, just referred to, afford us an ample acquaintance with the development of the newer Middle Lias and the Upper Lias in its Northward extension; but on this account we refrain from drawing more than closely relates to our present subject of the *Spinatus Zone*, and besides, in the absence of the illustrative accessories of Map and Sections, we would refer the reader to the paper itself. The *A. Spinatus* beds of the Middle Lias are seen in a section taken close to Tanna Point on the South East side of Portree harbour, Isle of Skye.

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* See Dr. BRYCE's Paper, Quarterly Journal Geol. Society, London, Aug. 1873.

To summarize, the section details a total thickness of *Am. communis* beds of 15 ft. 7 in.; immediately under these come about 60 ft. of Middle Lias as follows, of which I only quote sufficient to elucidate my subject.

SECTION, TANNA POINT, ISLE OF SKYE. MIDDLE LIAS,
(in descending order.)

	Lithology.	Fossils.
Ammonites Spinatus Zone.	*a.* Yellow calcareous sandstone, the upper more calcareous, and approximating to the dark-blue limestone at the base of the Upper Lias.	
Ammonites Margaritatus Zone.	*b.* Bluish micaceous sandstone, thinly bedded with lines of large blue calcareous nodules and *septaria*.	Ammonites margaritatus, Pecten æquivalvis, P. liasinus, (P. lunularis,) Limea acuticosta, Pentacrinus amalthei, and other fossils; (see Lists.)
	c. Hard micaceous, sandy, and calcareous shales, with rows of spherical calcareous nodules. This bed descends to the sea-line along the whole shore.	Pecten æquivalvis, Pholadomya ambigua, Plicatula spinosa, &c.

At p. 324, the East of Camus-Inivaig bay, the *Spinatus* beds are again noted, still the same yellow calcareous sandstone with sandy shales in the upper part of the series, and at p. 325, near Prince Charles's cave, we note the following instructive section, of which we give only the Liassic part.

SECTION.
PRINCE CHARLES'S CAVE, ISLE OF SKYE.

	LITHOLOGY.	FOSSILS.
	Upper Lias.	
Ammonites Communis Zone.	Black shale, with limestone nodules at top.	Am. communis Am. falcifer, Inoceramus dubius, Pecten personatus, and Belemnites of the same forms as occur in the alum shale of Yorkshire.
	Middle Lias.	
Ammonites Spinatus Zone.	Close-grained hard calciferous sandstone, with intercalated slightly ferruginous bands, &c.	Ammonites spinatus, Belemnites paxillosus, B. microstylus, Cryptænia expansa, Pecten æquivalvis, Plicatula spinosa, Cypricardia cucullata, Mytilus scalprum, Rhynchonella tetrahedra, R. acuta, Pentacrinites amalthei, &c.

This amount of proof will be sufficient, with the addition of yet a section from the Island of Raasay, at p. 336.

SECTION,
NEAR DUN-CÂN, ISLE OF RAASAY.
MIDDLE LIAS.

	LITHOLOGY.	FOSSILS.
Ammonites Spinatus Zone.	1. Yellow calcareous sandstone with nodules.	Am. Spinatus, Lima Hermanni, Pecten æquivalvis, Gresslya Seebachii, Ostrea cymbium, Avicula novemcostæ, Rh. acuta, Rh. tetrahedra, Waldheimia resupinata.
Ammonites Margaritatus Zone.	2. Bluish green calciferous, and 3. Shelly ferruginous sandstone. 4. Marly sandstone 5. Grey Marls 6. Greenish yellow sandstone 7. Shaly partings 8. Yellowish sandstone	Am. margaritatus, Isocardia liassica, Mytilus scalprum, Spiriferina rostrata, Rh. tetrahedra, &c.

Throughout the *Spinatus Zone*, about 40 ft. in thickness presents the same lithological features, and the same leading species. Unhappily, when we look for what will serve us to the Eastern coast of Scotland, we see magnificent sections of Middle Lias in Sutherland, but the very part we want is gone or concealed. Some 80 ft. of the lower clays of the Middle Lias (subdivision Gamma of QUENSTEDT) exist, and the probability is that the intervention of a great transverse fault, has brought down the clays of the Middle Oolite against the clays of the Middle Lias, and the portion we would fain summon as a witness, is unavailable, at least so far as the *Spinatus Zone* is concerned, yet they testify to what is of vaster importance than the existence of any particular Zone, namely, to the existence of the Jurassic sea in this latitude. Mr. JUDD in his able disquisition on the "Secondary Rocks of Scotland" (first part)* leaves the existence of the top of the Middle Lias an open question; for the occurrence of numerous boulders with Jurassic fossils of Middle Lias from the upper beds, so abundant in the Elginshire drifts, raises the hope that the parent beds may in places underlie the vast masses of Boulder clay which cover up the country. It is to be wished that the learned author will be enabled to revert to this interesting topic in the 3rd. part of his valuable work, his 2nd. part is on the "Volcanoes of the Highlands." In England we begin with the North coast of Yorkshire, which affords us sections most relevant to our point; here, fortunately, we possess the clearest and fullest light. The works of Prof. PHILLIPS, edited by Mr. R. ETHERIDGE, F.R.S., "The Yorkshire Coast" 1875, and Messrs. TATE and BLAKE, "The Yorkshire Lias," (Van Voorst, London, 1876,) give us all that we require. According to Prof. PHILLIPS, the exposure of the *Spinatus Zone* is well shown in Plate XX, where in the harbour at Staithes, the *Spinatus* sands are to be seen capping the *Colborn Nab*, with a thickness of 25 feet, and are on the other side of the harbour, thrown down to the base of the Cliff. In other parts of the coast they are much thicker. The Professor singles out the Staithes Cliffs, as they offer a most advantageous situation for measuring beds and collecting fossils of the series. Here the range and succession of the *Cephalopoda* can be well observed. The *Cephalopoda* are characteristically different in the different strata. The *Ammonites,* for instance, occur in the following descending order:—

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* Quarterly Journal, Geol. Soc. XXIX, 97, London.

1. *Ammonites annulatus* (*A. communis*)...above the Ironstone
2. ,, *spinatus*... ... ... in the Ironstone
3. ,, *margaritatus* ... ...in the Marlstone
4. ,, *maculatus* (*A. capricornus*) below the Marlstone

and so on with the other species.

Still pursuing the subject, we would refer to the more recent observations of the Yorkshire geologists. "The Yorkshire Lias" of Tate and Blake devotes 13 pages alone to the discussion and description of the *Spinatus Zone*, and rightly so, considering the interests involved, as all the workable beds of liassic ironstone are confined to this part of the Middle Lias. We might have readily quoted from the wealth of information brought together by these authors in favour of our views of this part of the Liassic series, but will avail ourselves of the transcript, with the kind permission of the Rev. J. F. Blake, M.A., F.G.S., of a single section of the numerous examples, in order that the reader may fairly compare our beds with the Yorkshire deposits of the same Zone.

"THE YORKSHIRE LIAS," p. 130.
SECTION OF THE SPINATUS ZONE AT OLD NAB.

No.	"Grey shales."	Thickness.		Fossils.
	Zone of Ammonites Spinatus.	ft.	in.	
1	Black micaceous marly shales.	1	5.	Pleuromya costata, Pecten æquivalvis, Pholadomya costata, Pinna spathulata.
2	Laminated shales.	0	9.	
3	Friable sandy shales with nodules.	1	6.	Pleuromya costata, Rhynchonella lineata
4	Greyish brown marly shales	0	6.	Ammonites spinatus, Pleuromya costata, Pholadomya costata, Unicardium subglobosum, Pecten æquivalvis, Modiola scalprum, Limea acuticosta, Protocardium truncatum, Rhynchonella tetrahedra.
		4	2.	

"THE YORKSHIRE LIAS. p. 130.
SECTION OF THE SPINATUS ZONE, AT OLD NAB,
Continued.

No.	"Grey shales."	THICKNESS.		FOSSILS.
	Zone of Ammonites Spinatus.	ft.	in.	
	Brought forward,	4	2.	
5	Sandy Marl	3	6.	
6	Top block of main seam, surface covered with branching fucoids	3	0.	Am. spinatus, Pecten æquivalvis, Pecten lunularis, P. substriatus, Unicardium janthe, Pleuromya rostrata, Rhynchonella lineata.
7	Shale	1	0.	
8	Bottom block of main seam, the surface covered with long tortuous fronds	2	2.	
9	Shale	0	8.	Pholadomya ambigua, Plicatula spinosa, Ostrea submargaritacea, Rhynchonella lineata.
10	Ironstone	0	4.	
11	Shale	0	6.	
12	Ironstone	0	4.	
13	Shale	0	6.	
14	Ironstone	0	7.	Belemnites breviformis
15	Shale	0	10.	B. breviformis, Pecten æquivalvis, Monotis cygnipes.
16	Ironstone	0	6.	M. cygnipes, Arcomya arcacea, Ostrea submargaritacea, R. tetrahedra.
17	Shale with a ferruginous parting	0	8.	Pecten æquivalvis, P. lunularis, Monotis cygnipes, Ostrea submargaritacea, Plicatula spinosa, R. calcicosta, Ter. punctata.
18	Ironstone	0	5.	Lima Hermanni, Rhynchonella tetrahedra.
19	Marly shale	2	6.	Pecten æquivalvis.
	Total	21	8.	
	Zone of Am. Margaritatus.			

To cite testimony in favour of our own *Spinatus Zone* would be futile; but as Gloucestershire must not pass unnoticed, it will suffice if I mention that in the volume of the Palæontographical Soc. issued for the year 1861, is a Monograph of the British Fossil *Echinodermata* from the Oolitic formations by Dr. Wright, London, 1862, where my friend has prefaced his account of the Oolite *Asteriadæ*, by an excellent description of the Lias formation. This demands notice, because although fitly placed where it is, it would, on the score of utility, have been not less than judicious had it been reprinted, as it would make the best hand-book we could have of the Lias of Gloucestershire. In this carefully prepared *resumé*, the sub-divisions or stages of the Middle Lias, are stated to be five in number. A short but terse description of the *Spinatus Zone* is there given. And this may be supplemented by a perusal of perhaps the more matured views of the same author in his elaborate "Correlation" paper* at page 164 of the Proceedings of the Cotteswold Naturalists' Soc. for 1869. This is a valuable testimony I can adduce from one who has spent his best years in pursuing these studies after the Baconian method of interrogating nature, and patiently, and reverently awaiting a response. In the South West of England, Mr. Chas. Moore has published the results of his labours among the Middle Lias deposits of that part of the country. His work which clearly bears the impress of great industry, is entitled, "On the Middle and Upper Lias of the South West of England," by Chas. Moore F.G.S., in the Proceedings of the Somersetshire Archæological and Natural History Society, vol. XIII, 1865—1866. In this treatise Mr. Moore describes sections taken at various places in Somersetshire; in some of them he has been very happy in the collection of new species of liassic fossils, and his work affords indications, both petrographically and palæontologically, of the existence of a capping of the *Spinatus* beds overlying the Marlstone rocks; but in consequence of the author throwing them all together, like the older geologists, under the general title of *Marlstone*, his results stratigraphically seem vitiated and disappointing, somewhat reminding us of the sage dictum of the jurists, "*Dolus latet in generalibus.*"

Perhaps a work more able than that on the Geology of Rutland &c., by Mr. John Judd ("Memoirs of the Geol. Survey," London, 1875) cannot be read; it deserves careful attention. The features of the Middle Lias, in the county he describes, are so like those of the Gloucestershire Lias, that in the vignette of the village of Somerby, Rutland, situated in one of the deep sinuous valleys of the great escarpment formed by the Marlstone Rock, if the word Churchdown had been written under it, we could not have distinguished it from the saddleback leading from Churchdown Hill to Tinkers' Hill. In Rutland the Marlstone attenuates rapidly from 18 ft. 6 inches to 1 foot, (see p. 65) "It loses its calcareous character and becomes sandy," and "when the junction of the Upper Lias clay and the Marlstone rock-bed is seen, the latter presents the appearance of having suffered erosion before the deposition of the former," and "taking into account all the characters presented by the Marlstone rock-bed, and remembering the evidence of shallow water conditions the beds (*i.e.* the *Spinatus beds*) immediately lying upon it exhibit, it seems probable, that an interval occurred between the deposition of the Marlstone and Upper Lias; but when we remember the fact of the passage of certain species from the one to the other, especially of the *Planulate Ammonites*, it is clear that this interval was not one of long duration." This might have been written of the Gloucestershire *Spinatus* beds, so that, externally and palæontologicaly, there is unity as to operation and results, between the Middle Lias of the Midland counties and our own. Mr. Judd finds in the *Spinatus Zone* of Rutland that the *Am. Spinosus* is rare, but *Belemnites paxillosus* and *elongatus* are abundant and often of large size. Though loth to multiply instances, we pause to mention the exceedingly good Jurassic series that we are acquainted with, through a communication of the Rev. J. E. Cross in 1875, "The geology of N. W. Lincolnshire" (Quarterly Journal, Geol. Soc. XXI, p. 115). To this instructive succession ranging from the Keuper up to the Great Oolite, inclusively, attention has been drawn by the discovery of an extensive deposit of valuable iron-ore that is being worked from the middle of the Lower Lias. The district has also its special value for the geologist, inasmuch as it supplies a connecting link in the chain of the Jurassic strata from Whitby to Charmouth. We naturally turn to it for evidence either way upon the existence of the *Spinatus* beds, to know what manner of strata they are, and here we have, as regards the Middle Lias, almost a repetition of what I have mentioned at page 393, on the Luithorst section of the Markoldendorf Basin near Einbeck, in Germany, where the Middle Lias (upper part) is so far dismembered that the *Margaritatus* beds are lacking, and in consequence, the *Spinatus* beds lie immediately upon the *Capricornus* beds.

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*On the Correlation of the Jurassic Rocks of the Côte d'Or with those of Gloucester and Wilts. Proceedings of the Cotteswold Naturalists' Field Club, 1869.

SECTION
OF THE MIDDLE LIAS OF NORTH WEST LINCOLNSHIRE.
EAST END OF SANTON RAILWAY CUTTING.

	PETROLOGY.	Thickness	FOSSILS.
Upper Lias.	Blue shales.	60 ft.	Ammonites of the *Falcifer* type. Am. communis, Am. serpentinus.
Middle Lias. *Zone of Ammonites Spinatus.*	Hard light-grey limestone, weathering to brown. "*Rhynchonella Bed.*"	8 ft. to 9 ft.	Ammonites communis in the Upper beds. Bel. paxillosus (large), Myacites unioides, Goniomya, Avicula cygnipes, Tereb. punctata, Rhynch. tetrahedra (frequent), Spiriferina (very rare), Ammonites spinatus, in the Lower Beds.
	Green band, a confused mass of pyrites and shells.	1 ft. 6 in.	Broken Belemnites and other shells intermingled.
Zone of Ammonites Capricornus	Blue clays containing cement nodules, having nuclei of *Ammonites capricornus* (Schloth).	66 ft.	Am. capricornus, Bel. paxillosus, (Sch) Natica cardium lobatum? (Quenst) Nucula inflata (Quenst), Myacites sp. Goniomya (rare), Plicatula spinosa (small), Ostrea læviuscula (Sow), Pinna, Lima acuticosta (Quenst), Avicula inæquivalvis, Gervillia lævis? (Buckm), Rhynch. variabilis (Schl).

We have taken the liberty of carefully tabulating as above, the author's observations, as we apprehend them, and we have great pleasure in directing the attention of the student to the original communication; for it affords much valuable insight into the relation of the Zones throughout the whole of the Jurassic series. We now descend towards the Southern parts of England, the scene of many labours in this particular field of the Cotteswold Naturalists and Geologists.

For the South coast of England, Mr. DAY's paper in the Quarterly Journal Geol. Soc. vol. XIX, the advantage of the accurate sections taken along the coast from Lyme to Charmouth by my friend Mr. ETHERIDGE, and my own studies along the coast of Dorsetshire, bring out most favourably the true character of the junction beds of the *Spinatus Zone* with the *Communis* beds. As an auxiliary to the comparison of the Dorsetshire Sections with the Gloucestershire beds, we would insert the following fine section of the *Spinatus Zone* as taken at Down Cliff.

SECTION OF THE SPINATUS ZONE
AT DOWN CLIFFS BY TOAD'S COVE, NEAR BRIDPORT HARBOUR.

Elevation.	No.	LITHOLOGY.	Thickness ft. in.	FOSSILS.
feet.		*Zone of Ammonites Jurensis.*		
400	1	Brown sands, sometimes micaceous, with large sandstone nodules in layers.	70 ... 0.	Ammonites opalinus, at Burton Cliff.
		Zone of Ammonites Communis.		
300	2	Dark greyish sandy marl, very micaceous.	72 ... 0.	Organic remains, rare and indeterminable.
	3	Brownish marly limestone with great numbers of *A. serpentinus* and other Upper Lias shells. The Middle Lias comes up to the lower part of this band of stone, for it contains *Ammonites spinatus.*	2½ ... 0.	Ammonites serpentinus, Am. communis, Am. bifrons, Am. Raquinianus, Pleuromya unioides, Venus pumila, Rhynch. acuta, Rhynch Moorei.
		Zone of Ammonites Spinatus.		
	4	Dark grey sandy micaceous marl.	18 ... 0.	Ammonites spinatus, Belemnites breviformis.
	5	Indurated sand, forming large sandstone blocks.	8 ... 0.	
	6	Light brown sands, more or less indurated and very micaceous.	56 ... 0.	

SECTION OF THE SPINATUS ZONE AT DOWN CLIFFS BY TOAD'S COVE, NEAR BRIDPORT HARBOUR,

Continued.

Elevation.	No.	Lithology.	Thickness ft. in.	Fossils.
		Zone of Ammonites Margaritatus.		
	7	Bluish marl, which forms a well defined band in the section.	6 ... 8.	
	8	Greyish sandy laminated marls, with irregular layers of nodules.	20 ... 0.	Am. margaritatus, Am. fimbriatus. Bel. elongatus, Pleurotomania anglica, P. expansa, Pleuromya unioides, Pecten æquivalvis, Limea acuticostata, Lima Hermanni, Pinna Hartmanni, Rhyn. acuta, Rhyn. tetrahedra, Gryphea gigantea.
	9	Foxy coloured sandstone with from 12 to 16 irregular bands of stone, "The rough bed" of the workmen.	40 ... 0.	
	10	Band of crinoidal limestone.		Pentacrinus subangularis
	11	Grey sandy clay, in parts micaceous.	20 ... 0.	
100		Band of ferruginous Septariæ.		
	12	Grey laminated sandy clay.	17 ... 0.	
	13	The "Starfish Bed," hard grey micaceous sandstone, large blocks from this lie on the shore.	6 ... 0.	Ophioderma Egertoni, Am. fimbriatus, Am. margaritatus, Bel. elongatus.
		Zone of Ammonites Capricornus.		
	14	Gray Marls.	76 ... 0.	Am. capricornus, Am. Henleyi, Am. Bechei, Am. Davæi.
		Base of the Down Cliffs.		

In this cliff section the *Spinatus* bed lies immediately in contact with the indurated sand of the Upper Lias, and a reference to page 94 of Mr. Day's Lias of Dorsetshire, elicits the observation that the appearances "point to a sea-bottom, upon which, for a long period, little or no deposit took place: the water-worn fragments which lie upon it, on the contrary, indicating that during that period, previously formed strata were again destroyed,"—showing an interval previous to the deposition of the Upper Lias. Turning from these physical considerations to the fossil evidence, Mr. DAY mentions a singular fact as to the restricted range of the Ammonites, and particularly in respect to the Zone in question. "*Ammonites margaritatus*, Montf. appears with the sand and mica in the "Three Tiers," (See Generalized Section of the Middle and Upper Lias of the Dorsetshire Coast, p. 288,) and disappears again with a deposit of marl; its place is, however, on the recurrence of sand, supplied by a closely allied form—*Am. Spinatus*, BRUG." Again, he observes that "In the lower part of the "*Spinatus Zone*" there appears to be a different fauna from that of the sands below, and in its upper portion occurs the most remarkable collection of Mollusca of any in the Lias." An inspection of M. DELESSE's magnificent "Carte Lithologique des Mers de France," clearly demonstrates to us the nature of the hydrographic basin, the petrology of the channel lying between the English and French coasts, and other striking phenomena; but the facts deduced for our purpose lie out before the eye more vividly, that is, the prolongation of the strata connected throughout so as to bridge the Channel geologically, and thus effect a continuity with the North West of France, and particularly with the Calvados. The French series of Liassic deposits in the North West were laid down under such strange and exceptional conditions that a true sequence cannot be expected. These conditions I have touched on elsewhere, and will not enlarge on.* The numerous works of the younger M. J. EUDES DESLONGCHAMPS on the Lias of the Calvados district should be consulted, as to the details of the Liassic strata lying deposed between and upon ridges of old rocks of schistous and metamorphosed structure. It is plain that even in this abnormal condition of the deposits, some succession of beds is possible, for M. J. EUDES DESLONGCHAMPS FILS, in his last communication with me, mentioned their *Spinatus Zone*.

For Normandy, Department of the Calvados and Lower Seine, we submit the following succession from the MM. DESLONGCHAMPS in their *brochure* entitled "Memoire sur la couche à Leptæna du

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*See Paper "On the occurrence of Plicatula lævigata, &c.," in the Proc. Cotteswold Club, 1876.

Lias," Paris, 1859. The sequence of the beds from the nature and manner of their deposition, does not easily, even where possible, admit of separation further than what is here stated.

SECTION TAKEN IN THE QUARRIES AT CURCY—(PAGE 8).
(CALVADOS DISTRICT.)

	PETROLOGY.	FOSSILS.
Capping Strata. Upper Lias.	A great series of yellowish or reddish ferruginous and argillaceous strata, enclosing rolled flints and fossils, from different beds of the Inferior Oolite.	
Ammonites Jurensis, and	Alternation of limestone and argillaceous thin-bedded stone.	Large quantity of Am. bifrons, Am. Hollandrei, Am. serpentinus, &c.
	Tenacious Blue, Yellow, and Black clay, 7 to 8 mètres thick. Courses of geodes with fossil nuclei.	Am. Jurensis, Geoteuthis. Fish: Posidonomya Bronni.
Ammonites Communis Zones.	Thin bed of reddish marl. *(Leptæna Bed)*, 1 to 2 decimetres thick.	Leptæna liassina, L. Bouchardi, Rhynch. pygmea, Ter. globulina.
Middle Lias. *Ammonites Spinatus,* and *Ammonites Margaritatus Zones.*	Greasy saccharoid limestone, 1 to 2 mètres thick, enclosing a very remarkable quantity of Belemnites and Brachiopods. The "roc" of the quarrymen, and the top bed of the Middle Lias of the country.	Am. spinatus, Am. margaritatus, Am fimbriatus, Belemnites paxillosus, large Gryphea cymbium, Spiriferina rostrata, Terebrat. quadrifida, Rhynch. tetrahedra, Rhynch. acuta, &c.
Lower part of the Middle Lias.	Alternate Marly and Limestone beds, more or less thick; enclosing Gryph. cymbium, Spiriferina verrucosa, Sp. rostrata, Rhynch. variabilis, Wald. numismalis, Harpax Parkinsoni.	

The Liassic deposits of the basin of the Rhone, are all in favour of our correlation. M. DUMORTIER* thus generalizes upon the fossils of the upper moiety of the Middle Lias the Zone à *Pecten æquivalvis.* He reviews the fact that the *Belemnites* which predominated in the lower portion of the Middle Lias now begin to die out, with the exception of the *Bel. paxillosus,* which lives on to the Upper beds, and one single species only, the *Bel. compressus,* appears here for the first time, and then disappears altogether. The fauna of the Ammonites shows a remarkable coincidence with the *Belemnites* of an im-

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* Eug. Dumortier. Études palæontologiques sur les Dêpots jurassiques du Bassin du Rhone, iii^{ème} partie, Lias Moyen, Paris, 1869.

portant species, the *Am. margaritatus*, M. Dumortier remarks :—
"*L'Ammonites margaritatus se propage et se continue seule, comme pour servir de lien aux deux Zones du Lias moyen ;—une autre espèce nouvelle éminemment charactéristique de la Zone supérieure, l'Ammonites Spinatus, fait son apparition pour ne laisser de trace de son passage que sur un bien faible épaisseur,*" p. 344. The *Am. Spinatus* is met with only in the upper part of the Zone. The Zone of *Pecten æquivalvis,* corresponds with our Lias in all important particulars, and its correlations generally are stated in the preceding tables. We extract this for comparison.

TABLEAU DES DIFFERENT NIVEAUX DE LA ZONE À PECTEN ÆQUIVALVIS ; DUMORTIER (P. III, p. 193.)

Zone à Pecten Æquivalvis.

	Fossiles Principaux.	
Niveau de la Limea acuticosta 2 à 3 mètres.	Ammonites spinatus	Tellina gracilis
	Chemnitzia Periniana	Avicula deleta
	Trochus Eolus	〃 cygnipes
	〃 nudus	Lima pectinoides
	〃 epulus	Ostrea sportella
	Turbo Licas	Rhynchonella acuta
	Cerith. reticulatum	〃 furcillata
	Cypricardia Falsani	
Niveau de l'Ostrea sportella 2 à 5 mètres.	Belemnites paxillosus	Mytilus Thiolliérei
	〃 compressus	Lima pectinoides
	Ammonites margaritatus	〃 succincta
	Chemnitzia carusensis	〃 punctata
	Trochus epulus	Avicula Munsteri
	〃 eburneus	〃 cygnipes
	〃 nitens	Pecten frontalis
	Turbo cyclostoma	〃 textorius
	〃 Socconensis	〃 acuticostatus
	Pleurot. precatoria	Harpax Parkinsoni
	Gastrochæna Lugdunensis	〃 lævigatus
	Pleuromya Jauberti	Gryphea cymbium
	Hettangia Broliensis	〃 gigantea
	Astarte striato-costata	Terebratula subpunctata
	〃 Branoviensis	〃 Waterhousei
	Cardinia crassissima	〃 cornuta
	〃 hybrida	Rhynch. tetrahedra
	Cardium multicostatum	Serpula Étalensis
		Cidaris amalthei

The beds of this Zone consist nearly everywhere of hard limestones; and the author gave his Zones the name of *Pecten æquivalvis* on the score of utility only, because of its wide range into other countries, and as it is a well-known fossil, generally well preserved and conspicuous.

The Spinatus deposits are to be studied in the Department of the Moselle, of the Meurthe, in the neighbourhood of Gundershofen on the lower Rhine, and in the Department of the Côte-d'Or, for which consult Dr. WRIGHT's valuable paper. They are also to be seen at Lozère, at Abeyron, and other localities, and are bibliographically dealt with in M. D'ARCHIAC's Formations Jurassique, vols. VI and VII, in his Hist. des Prog, de Géologie, Paris, 1856.

We now approach geographically the frontiers of this part of Europe, and would observe that even a cursory examination of the mutilated and obscured series of the Franconian and Suabian Lias, would much exceed our limits. This imperfection of the geological record, is a consequence of its position in regard to the region of the Alps, where incessant perturbations contemporaneous with the deposits of the period, told upon them in a most efficacious manner to disturb their unity, and disarrange that more perfect order which exists in our undisturbed typical English Lias. So, deferring our remarks upon the Lias of the Franconian and Suabian Jura, we now glance at the results won for us by the chief German workers in the field of Liassic geology.

The honourable labours of QUENSTEDT and OPPEL have been so many years before the world of Science—in the one case the valuable palæontology; in the other, the exact terminology based upon a wide induction of particulars; the one a rich storehouse of facts; the latter assimilated and applied by the leaders amongst the geologists of Europe—that we assume their works are sufficiently familiar to need little more than a simple reference. We would only for convenient comparison cite from the *Juraformation* of Dr. OPPEL, this arrangement for Wurtemberg and Northern Franconia (Bavaria).

(WURTEMBURG &c.)

	Name.	Fossils.
Second stage of Middle Lias.	*Ammonites Spinatus Beds.*	Ammonites spinatus, Bel. breviformis, Bel. crassus, Rhyn. quinqueplicata, Waldheimia Waterhousei, Waldheimia perforata, Terebrat. punctata, Spirifer Haueri, Chemnitzia nuda, Lima Hermanni, Inoceramus substriatus, Pecten æquivalvis, Gryphea cymbium, Rhyn. amalthei, Pleurotomaria anglica, Pleuromya costata.
	Upper *Ammonites Margaritatus Beds.*	Ammonites margaritatus, Am. Normandianus, Am. Zetes, Bel. compressus, Bel. lagenæformis, Chemnitzia undulata, Turbo paludinæformis, Pleurotomaria rotundata, Leda acuminata, L. complanata, Cypricardia caudata, Pinna Moorei, Pecten Philor, Pecten sublævis, Cardium truncatum, Pentacrinus lævis, Terebratula scalpellum, Spirifer Tissoni, Ammonites Henleyi.
Lower Ammonites Margaritatus Beds.		

We may now resort to less familiar names; one who was a fellow labourer, and to whom both Quenstedt and Oppel owe much, M. Pfizenmayer, describes three subdivisions, which we also annex for the Lias of South West Germany. (Würtemb. naturwiss. Jahrb. 1856, p. 109.)

(S. W. GERMANY.)

	Petrology.	Fossils.
Horizon of *Ammonites Spinatus.*	1. Marly Limestone, of a light colour.	Ammonites spinatus, Belemnites breviformis, Spirifer. rostratus, Spirifer. verrucosus, Tereb. punctata. Ter. subdigona, Rhyn. quinqueplicata.
Ammonites Margaritatus Beds.	2. Dark blue Clay.	Am. margaritatus gigas, A. Englehardti, A. heterophyllus, Bel. elongatus, B. compressus, B. acuarius, Scalaria liassica, Pecten glaber, Pentac. basaltiformis.

A German authority, meritoriously of great weight for sound knowledge and application, was the late U. Schlönbach, who has with much care and painstaking, correlated the North German Lias, and incorporated the deductions in an excellent paper with illustrations, in the Journal of the Geol. Soc. (Zeitsch. d. deutschen geol. Gesellsch. Jahrg. 1863.) I possess a copy of another work by him, a scarce tractate on the succession of the beds of the Under and Middle Lias in North Germany, entitled "Die schichtenfolge des unterem und mittleren Lias in Norddeutschland von Herrn U. SCHLÖNBACH in Salzgitter, Berlin, 1863."

The Liassic sea of North Germany communicated with that of Wurtemberg and Bavaria on the South, in a way still very far from clear. Very likely the communication was along the *triassic* rocks by Göttingen, Eisenach, Gotha, Cobourg, and Cassel, as we may presume from certain traces of the lower divisions of the Lias, which stand here and there in testimony of the ancient extension of the deposits. We would press into our service the account given of some of the higher divisions. The Middle Lias of Markoldendorf has been well-known to many geologists for its fossil fauna, through Dr. A. RÖMER, who treats upon its palæontology in his "Versteinerungen des Norddeutschen Oolitengebirges," Hanover, 1836. The M. Lias lies in a curious trough-like form of elongated oval shape, running with a longitudinal axis from North West to South East between Markoldendorf and Einbeck, situated on the river Ilm, about 40 miles South of Hanover. This so called Liasmulde or Lias-trough, is very instructive from the sequence of the strata having been preserved through the quiet deposition of its sediments. The locality has been well explored and the result fully given by Dr. EMERSON, in the German Geol. Journal (Band XXII der Zeitsch. d. deutsch. Geol. Gesch. 1870, p. 271). The trough is sharply faulted near its western boundary; but on the North West lie some detached strata of the *Spinatus Zone* at Luithorst. A short reference to these will be suggestive as to the original sequence and the extent of these particular beds, the exceptional circumstance being that the Spinatus Beds, no doubt in consequence of an oblique compound fault or a lateral branch of it, has been brought down to repose upon the *Am. centaurus* beds which would be equivalent in position to the lower portion of our *Am. Capricornus Zone*;—so that all the

Am. margaritatus beds are missing, and the *Spinatus* beds lie apart from the main trough in a depression near Luithorst.

THE MARKOLDENDORF BASIN.
SECTION OF THE SPINATUS ZONE, MIDDLE LIAS NEAR LUITHORST
(Dr. EMERSON).

Middle Lias	PETROLOGY.	FOSSILS.
Zone of Ammonites Spinatus.	Blue or Grey shales containing ferruginous concretions (Sphaerosideriten=chalybites or spathose iron).*	Ammonites Spinatus (Brug), Nautilus intermedius (Sow), Belemnites clavatus (Mill), Turbo paludinæformis (Schubl).
Zone of Ammonites Capricornus. (lower part)	Rich ironstone of Oolitic structure; contains an extraordinary abundance of Gasteropods (25 métres thick in places).	Am. Henleyi (Sow), Am. centaurus (d'Orb), Am. brevispina (d'Orb), Am. fimbriatus (Sow), Nautilus intermedius (Sow), Bel. clavatus, (Schloth) Bel. elongatus (Mill), Ter. numismalis (Lam), Spirifer rostratus (Schl), Pecten Hehlii (d'Orb), Pecten priscus (Schl), Lima acuticosta (Goldf), Inoceramus ventricosus (Sow), Turbo and Pleurotomaria, &c., &c.

Near Göttingen at Northeim and Hainberge the *Margaritatus* beds make their appearance.

Professor U. SCHLÖNBACH, notes that in some places in this part the limit between the lower *Spinatus* beds, and the Upper *Margaritatus* are decidedly sharp, whilst in others the limit is lost or indistinct, which is only what we should look for. The characteristic Ammonites of each facies will some few live on, they can surely not become extinct to a single individual at the terminal range of the species; but yielding constantly to the conditions which effect mutation—conditions that are productive of continuous insensible changes—it is scarcely credible that individuals are all affected *pari passu*; the consequence, if this view be correct, would be a blending of species and an indefinite limit; no one could for a moment fancy a hair breadth line to exist as the result of such changes; we have mentioned before that the association of the leading Ammonites at the junction of the Zones in question, the *Spinatus* and the Upper *Margaritatus*, is not infrequent, whilst the fauna of each indicates a sufficient difference to afford a criterion. This digression will assist us to usher in the correlation of U. Schlönbach, which is identical with our own, and based upon similar grounds.

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* I have recorded the Sphaerosiderites or Carbonate of iron, the spathose iron of PHILLIPS, (Phillips's Mineralogy, edited by H. T. Brookes and W. H. Miller, 1852) from the Churchdown *Spinatus Zone.*

Die Schichtenfolge des unt. Mittl. Lias in Norddeutschl. p. 168, 1863.

MIDDLE LIAS. N. GERMANY.

Suabia after Oppell.	North Germany (according to U. Schlönbach.)
Zone of Ammonites Spinatus (Brug).	Zone of Ammonites Spinatus (Brug).
Upper Zone of Ammonites Margaritatus (Montf).	Upper Zone of Ammonites Margaritatus (Montf).

The other work of U. Schlönbach "Ueber den Eisenstein des mittleren Lias im N. W. Deutschlands," 1863, confirms distinctly the same view, by numerous details, which assist us materially in elicting the truth and obtaining trustworthy data. Amongst many sections of the crowning beds of the Middle Lias that will bear out this correlation, we select from those of Harzburg, Liebenburg, Haverlah, and Calefeld, sections which all display the *Spinatus Zone*, as in the profile below.

SECTION OF THE SPINATUS ZONE.

HARZBURG.

	Petrology.	Fossils.
Ammonites Spinatus Zone.	Blue Clay	Ammonites Spinatus (Brug).
Ammonites Margaritatus Zone.	Yellow Clay, with course of shelly Marl. (numerous fossils.)	Am. Spinatus and Am. Margaritatus.

According to U. Schlönbach, there are exposures of Middle Lias throwing light upon the succession of the strata of the Upper Zones, at Liebenburg not far from Goslar. The section and description he gives at p. 488 *et passim*, yield us much insight.

SECTION.
OF EISENSTEIN. MIDDLE LIAS.
LIEBENBÜRG.

Divisions.	No.	PETROLOGY.	Thickness.	FOSSILS.
	1	Thick grey and brown clay containing ironclay nodules and "Nagelkalk" beds.		Appear to be unfossiliferous.
Ammonites Spinatus Beds,	2	Greyish blue clay.	9 mètres.	In the Upper part, Am. spinatus (Brug), only :—abundant.
and Upper *Ammonites Margaritatus Beds.*		Greyish blue clay.	9 mètres.	In the lower part, Am. margaritatus, (Montf) abundant, Belemnites compressus (Stahl).
Lower *Ammonites Margaritatus Beds,* and *Ammonites Capricornus Beds.*	3	Grey, not very hard, somewhat Oolitic Limestone. Very fossiliferous.	½ mètre.	Am. margaritatus (Montf), Am. Loscombi (Sow), Am. fimbriatus (Sow), Am. capricornus (Schl), Belemnites paxillosus, Bel. clavatus (Schl), Pleurotomaria granosa (Schl), Rhynch. triplicata, sp. (Phillips), Terebratula numismalis, &c., &c.

As to the description of this example, the Author observes, that in No 2, the grey blue clay, he finds only the *Am. Spinatus* in the upper half of the beds, and *Am. Margaritatus* in the lower half; and both species are abundant. He also remarks that he can engage with certainty that *Am. Spinatus* first occurs at 9 mètres distance above the bottom line of the clay marked No. 2 division. In the 18 métres of greyish blue clay which seem to be homogenous throughout, although no exact medial line can be drawn, yet the phenomenon of one species of Ammonite being replaced by another species, is of striking interest biologically, as illustrating the law of restriction of their short range of life. In the lower moiety of No. 2, greyish blue clay, U. SCHLÖNBACH also notes that the fauna of the beds comprises a number of species of fossils, recorded by Oppel as marking the Upper part of the *Margaritatus Zone.* Finally, he observes of the whole, that in North Germany *Am. Margaritatus* comes most in clay beds, whilst *Am. Spinatus* mostly occurs in the grey limestone strata. Both of these are met with at different levels; *Am. Spinatus* in the upper, and *Am. Margaritatus* in the lower beds. In North Germany he thinks, further, that it wants a special study of the localities in order to determine truly and distinctly the uppermost part of the Middle Lias constituting the *Spinatus Zone.* Before dismissing this part it would be well to notice a comparatively recent work on the Jura in North West Germany, by Dr. Brauns, published in Brunswick, 1871. We do not find ourselves in accord with the writer at certain stratigraphical points, yet on the whole it is a meritorious work; his treatment of the palæontology is marked by scholarly painstaking, though withal, a certain *Allgemeinheit* is not wanting. The historical part is more open to remark; for instance, in treating of the English Lias in Der untere Jura, at p. 157, he seems to have adopted the general statements of De La Beche for Dorsetshire, and the earlier works of Phillips for Yorkshire; so that on such critical matters as the possibility of separating a *Spinatus Zone* from the *Margaritatus* (Amaltheenthone), his views are somewhat obsolete. Our object has been simply to offer an illustrative, and by no means complete narration of the instances where the *Spinatus Zone* is exemplified on the Continent or elsewhere. We, therefore, end by mentioning in addition, that these strata have been examined at Aldorf in Bavaria; on both sides of the main channel of the Danube, where they are extensive and characteristic, containing numerous leading fossils contained in geodes: and, moreover, have recently been traced and described by Dr. Johann Böckh, in the southern portion of the Bakony, the country south of Buda Pesth, traversed by a tributary of the Danube. Consult a valuable memoir containing an account of the Palæontology of this district in "*Die Geologischen Verhältnisse des Südlichen Theiles des Bakony. II Theiles,* Pest, 1874." From the Middle Lias of

Hungary, to revert to the Cotteswold is rather an abrupt transition, but now a brief review of the points of comparison will have its place. The group of organic forms disclosed by the Gloucestershire Zone of *Am. Spinatus,* corresponds, and is in unison with, the same phase of life, and is on the same level with the capping strata of the Middle Lias wherever it was deposed quietly and under normal conditions; whether in the distant Isles of the North sea—in the broad belt that slopes across England—throughout the anglo-French and the Rhone basins—along the banks of the Danube—in the Suabian and Franconian Jura, or in other links of connection wherever these deposits can be observed, they speak of the Liassic sea *in space* and *in time,* as of a definite and special biological manifestation. And though it may be alleged that we have selected isolated facts, and dwelt more on resemblances than differences; yet the very title of our paper would contravene the assertion; for it would be incorrect to speak of the Lias of Churchdown and the Cotteswolds as a selected locality wherewith to work out the problem. The intimate opportunity of observing the geology of Gloucestershire arose from the simple accident of my residing near to the exposure there of the Middle Lias, and so of enjoying more frequent opportunity of studying these records of past life, and of correlating them with distant strata. This statement disposes of the imputation of selected facts; and as to its isolation, this is an equally idle assertion: for that the Gloucestershire Middle Lias can be followed step by step in its Northerly extension has been already shown: and for its range southward, the Cotteswold Lias can be traced hence along the patches and fragments of the Mendip Hills to the Somerset district; and to the South West coast-line between Charmouth and Bridport; and thence in directions on the Continent of Europe that we need not reiterate: so that instead of isolation, there is positive continuity; and for study there is no selection of particular points—no suppression of unfavourable examples; we appeal for criteria of the truth, rather to the undisturbed and quietly deposed sediments of the Liassic sea, and where these are found, they support the view here taken; not, on the contrary, to examples that have either been deposed under abnormal conditions, or disturbed and altered by perturbations violent enough to uplift, fold-over, and sculpture the Alpine chains of Europe. It will now need little mental exertion in generalizing from our *data,* to attain the conviction that the *Spinatus Zone* of Gloucestershire, as exhibited in its typical example at Churchdown, is to be regarded as a general and complete type of this subdivision; also, that the Zone is extremely persistent, and of considerable horizontal extent. A closer acquaintance with this Zone, at Churchdown, than many can possibly have, has led us to ponder on its nature and character, and by degrees to carry our views farther onward: and so to utilize our deductions, as to realize cautiously and carefully the boundary line of the great Jurassic sea, with its intricacies; its archipelagic features; its contours and coasts; as well as its vicissitudes throughout geological time. This imperfect sketch is lacking in unification, and proportion, still we venture to trust it may conduce to a clearer and more distinct recognition of that border territory and its interesting phenomena, which, closing the Middle Lias, ushered in the changed conditions intimated far from dimly in the *Communis Zone* of the Upper Lias. The next step after patient observation, is careful comparison; and it would seem that here I have simply looked into certain given passages of an old text, and collated them with records of nature, more distant and less accessible, than the Middle Lias of Churchdown and Gloucester, when taken by itself, can possibly afford; and thus endeavoured to recover in some measure, an obscure portion of the history of the past.

VII. NOTES AND REFERENCES.

Under this heading, we prefer to enter such notes or remarks as are connected with the subject, or else important; and which, if introduced in the course of the previous discussion, would have only encumbered the text. First, of a general but most useful character, comes the subject of geological language, on which Prof. Renevier has taken immense pains: his remarks we introduce by observing that his object is to recommend a greater precision in the use of terms. He says, in Natural History there is a well understood scale of language, *e.g.* A Class is divided into Orders; an Order into Families; a Family into Genera; and a Genus into species. But against geologists he imputes, that they use their appellatives with a laxity that is confusing and reprehensible. He, therefore, proposes to distinguish 4 orders of subdivisions in geology, as the following, placed according to their rank.

1st. Order,	called	Eras.
2nd. —	,,	Periods.
3rd. —	,,	Epochs or Systems.
4th. —	,,	Ages, Stages, or Horizons.

The Spinatus Beds *e.g.*, would belong to the uppermost beds of the Middle Lias.

1. To the Mesozic Era.
2. ,, Liassic Period.
3. ,, Middle Lias system.
4. ,, Spinatus Stage, Age or Horizon.

The word *formation* should only be used to denote the *mode* of formation *e.g.* The *Spinatus* beds are of marine formation. In the interest of the exact sciences, I have digressed to introduce the topic; and it would be well if all would strive to profit by the well meant aim, to ensure greater exactitude in the use of technical language.

A few words may be admissible on the general nature of Zonal subdivisions of the Jurassic or other sedimentary formations, as the subject is often misrepresented. An Ammonite Zone, which, by the way, begins in a practical need, can only express by vague hint or symbol, the spirit or life of a period. Supreme as the Ammonite may be, it credibly witnesses the recognition of the life of such period. It is as it were an *exponent* of an assemblage of life forms of limited range; and so, in truth, marks a particular phase of life, and brings it into prominence, where, otherwise, it would be obscured, or even passed by unheeded. This, a mere conventional terminology, such as the Greek letters of QUENSTEDT, or the topical appellative of Midford Sands, or *Marnes de Pinperdu,* can never do. Well, as we accord the leadership of the Mollusca of our present subdivision, the Spinatus Zone, to the Ammonite named the *Amaltheus Spinatus,* of BRUGUIERES, which gives its name to the Zone, we would observe that this characteristic shell is easily known, and may be verified in case of doubt, by the peculiar fine crenulated markings on each side of the keel, mentioned in his diagnosis of it, by BRUGUIERES, in 1789. It has had given it the name of *A. Costatus,* by REINECKE, which will explain the occurrence of the word in our table of Synonyms. A confusion may arise, if not pointed out, from its having been named *A. geometricus* by Prof. PHILLIPS,* a species which is our well known *A. semicostatus* (YOUNG & BIRD), and is a Lower Lias species common at Churchdown by the Reddings, at the level of the brook, and above the Bucklandi beds; and elsewhere always occupies the same horizon. BRUGUIERES *A. Spinatus* also, is the *A. Hawskerensis* (YOUNG & BIRD) of the older Yorkshire geologists. Characteristic Ammonites associated with *A. Spinatus* are the *Harpoceras Normanianum* (WAAGEN), and the *Harpoceras Thouarsense* (WAAGEN), both Falciferi, and both species of A. d'Orb. They afford us model examples of what QUENSTEDT styled, *A. radians depressus* in his Cephalopoda, plate 7, figs. 4 and 8. Several small examples of *Stephanoceras annulatum* were met with in the upper part of the Spinatus sands, they were the precursors of significant changes.

A rare form of Cephalopod yielded by the Spinatus sands at Churchdown, and in my possession, belonging to the family Teuthidæ, is a species new to our fauna; to this I have given, provisionally, the M.S. name GLEVENSIS, after the ancient name of Gloucester. The *Beloteuthis Glevensis* (SMITHE), measures 3½ inches by 2 inches; it is nearly smooth, with fine striæ curved in an oblique direction to the keel, and on each side of it, and except in the markings, is not unlike the *B. subcostatus,*

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* Phillips' A. geometricus, according to Tate and Blake,—A. solitarius of Simpson. But according to Brauns—A. spinatus, Brug. non Oppel, nec auctt.

Quenstedt—*venusta* of Munster, fig. in Quenstedt's Cephalapoda T. xxxii, fig. 8.

The profusion of Belemnitidæ at Churchdown is amazing. In certain beds, the remains lie, not only side by side, but crossing and enmeshed. A peculiarity of the *Spinatus Zone* is the large size attained by *Belemnites paxillosus*: this has been also noticed in the Spinatus beds on the Continent. Prof. Phillips observes of the family, that "*Bel. elongatus, apicicurvatus, paxillosus* and *cylindricus* taken together, compose a natural group of generally cylindrical or cylindroid forms, with dorso-lateral grooves at apex, and striæ on ventral and dorsal aspects. They are unknown in Lower Lias, but go through Middle Lias; and are found in Dorsetshire, Gloucestershire, Northamptonshire, Lincolnshire, and Yorkshire." Phillips, Belemnitidæ, iii, p. 87.

The succession of Belemnites observed at Staithes, *apud* Phillips, would be this:—

Bel. cylindricus	occurs in	Shales above Ironstone series.
Bel. rudis Bel. breviformis	,,	the Ironstones.
Bel. numismalis	,,	the Marlstone.
Bel. pollex	,,	the Lower Lias immediately below the Marlstone.

In the "Yorkshire Lias" 1876, the authors have entered as many as 40 species of *Belemnites* in their Table of Lias fossils.

It may be assumed from previous remarks that Brachiopoda of the Tretenterata division, are scarcely to be expected in the Spinatus sands under certain special conditions. But an exception has just been noted in the *Spinatus Zone* of Kings Sutton near Banbury, where a new species of *Crania*, to which the name of *Crania Griffini* (Davidson), has been assigned, rewarded the search of Mr. Innes Griffin. It will be figured and described in the 2nd. part of the forthcoming supplement to the Brachiopoda, (Davidson) Palæontographical Society, 1877.

Prof. Ralph Tate (Yorkshire Lias, p. 418) remarks of *Waldheimia sarthacenthis* of d'Orbigny "The shell is distinguished by its subpentagonal form and small umbo and is closely allied to *W. indentata* (Sowerby), but does not present an indented front, from which character the latter species owes its name." Having had the advantage of examining a French type of *W. sarthacensis,* we have hitherto found no form that corresponds with it in our Lias: and with regard to the indented character of *W. indentata,* this we can affirm to be not a constant character. *W. indentata* is often mistaken when not adult, from inacquaintance with a fact established by Mr. Davidson after a careful examination of a large number of perfect specimens of the shell in every shade of growth from our Spinatus beds, that the indentation is not always present, or is at least an inconstant character.

Another point worth stating may be mentioned of the adult state of *Waldheimia rimosa,* deduced from Mr. Davidson's examination of a large suite of specimens from Churchdown, comprising shells of different ages, that the bifurcation of the ribbing in this species does not begin in the youngest state, but is only developed as the shell advances towards full growth.

Terebratula punctata (Sow). To this name must be assigned the so-called species *Terebratula* (Epithyris) *subovöides* of Roemer. This was for some time a vexed question with U. Schlönbach, Oppel, and other Continental authors. The name, *T. subovöides* was espoused by Oppel, Deslongchamps, and others. But Mr. Davidson, with indefatigable patience and research has at length settled the matter, and disposed of Roemer's name. It is singular that a subdivision of the Middle Lias in Germany had been termed by Roemer, the *T. subovöides* Beds. These must now be known as the *T. punctata* Beds. A complete and searching revision of the group of *T. punctata* and its allies, accomplished with unsparing pains, is clearly set forth in the first part of the Supplement to the Brachiopoda in the Palæontog. Soc. volume for 1877.

Plicatula spinosa. A variety in its young state with a smooth test, has been described by R. von Roemer under the name of *Ostrea orbicularis* (Ool. p. 61, T. 3, fig. 14); it is very likely the same as Rolle's and Goldfuss's *Plicatula sarcinula*, which I have entered in the general list of fossils from the *Spinatus Zone.*

Unicardium Janthe, d'Orb (Prod. 8, 179).

A form similar to this, found in the Spinatus Beds, occurs as low down as the Zone of *Am. Jamesoni,* and throughout the Middle Lias infrequently. It appears to be the shell meant by d'Orbigny under the scanty description he gives "*Espèce voisine de l'Unicardium cardiöides mais subequilaterale, ovale, arrondie aux extremités*: it is probably only a varietal form of *U. cardiöides.*

The inconstancy of character discerned in the *Ostreæ,* creates a difficulty, which, apart from speculation or discussion of biological causes, can only be practically met by seizing upon well marked forms, to which geologists have agreed by tacit consent to attach names. Such a well understood form is that of *Ostrea cymbium,* which exists in the Spinatus and other Zones of Middle Lias, and was adopted as a classical appelation of the Middle Lias by Leymrie in 1872, who designates the Middle Lias the *Cymbium stage* of the Liassic system—the *Charmouthien stage* of Karl Mayer, 1874. The *Ostrea cymbium* of our *Spinatus Zone* is generally of small size.

Avicula calva, n. sp. U. Schlönbach. A small tumid species I refer to this name; the shell is not unlike *A. papyracea,* but more tumid, and has faint concentrical markings just perceptible.

Modiola ornata (Moore). (On the Middle and Upper Lias of S. W. England P. vii, fig. 7.) Mr. Moore obtains this shell from Ilminster. "Shell transversely ovate; gibbous, beaks small, incurved, nearly anterior; pedal region short, rounded; dorsal and posterior margins rounded, middle and ventrical margins slightly sinuate; back of the shell diagonally gibbous, and covered by striæ, which pass from the umbo to the dorsal margin and posterior end. A slight sulcus divides the gibbous back from the anterior end on which the striæ are obsolete.

The striæ are crossed by numerous narrow lines of growth, which give the shell a reticulated appearance."

The *Macrourous Crustacea* contributed hitherto by the Spinatus sands at Churchdown, include some examples just perfect enough to be determined generically, but not in each case specifically. They are referable to the genera *Eryma* (Meyer), *Glyphea* (Meyer), and *Pseudoglyphea* (Oppel).

Of the *Pseudoglyphea sp.* I possess part of a shell or carapace, and a fragment of a claw, which were kindly named by Mr. H. Woodward, F.R.S.

It would seem that many of these forms appear in the Lias and run persistently through the Jurassic series, and singular enough a great many of them agree in identity with species found only in the lithographic stone of Solenhofen in Bavaria. Mr. H. Woodward has remarked, "The persistency of such forms as *Eryon*, *Eryma*, and *Glyphea* seems clearly to demonstrate that having escaped total extinction in the Lower Lias sea, they must have migrated from time to time to more favourable areas, and thus have been enabled to live on, during the deposition of the long series of sedimentary deposits, up to the period of the deposition of the lithographic stone in which so many examples are found fossil."

The Count Gaston de Saporta, who has devoted special study to the fossil algæ, kindly communicates the following remarks on one of the Churchdown specimens from the *Spinatus Zone.* "Votre fossile me parait être une Algue comparable à celles nommées Palæophycus, par Hall, et dont Schimper donne ainsi la diagnose: 'Frons simplex vel ramosa, cylindrica vel subcylindrica, hinc inde articulata'—cette définition s'applique bien à votre fossile dont les ramifications paraissent avoir été articuleés ça et la. Les Palæophycus de Hall sont Devonien; mais les types d'algue palæozoique ont persisté en grand partie pendant toute la période secondaire où l'on remarque les correspondances suivantes :—

Spirophyton	(Devonien)	Camellophycus	(Jurassique)
Palæophycus virgatus	(Devonien)	Siphonites	(Jurassique)
Butrotrephis	(ex parte Devonien)	Chondrites	(Jurassique)

Il n'y aurait donc rien de surprenant à ce que le type du Palæophycus, devonien, du Palæophycus tubularis, de Hall, reparut dans le terrain jurassique, à l'exemple des précédentes."

The fear of exceeding the space allotted has hindered us from extending this section of our subject, by drawing upon that prodigality of material which the palæontology of our Lias affords; for with descriptions of species, however brief; notes and synonyms; the room required would be not inconsiderable. We conclude that the palæontology of the Lias might well make a separate and distinct series of contributions.

END OF VOL. VI.

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